CHAPTER 10

NON-WATER QUALITY ENVIRONMENTAL IMPACTS

10.1 Introduction

As required by Sections 304(b) and 306 of the Clean Water Act, EPA considered the non-water quality environmental impacts that would be associated with the implementation of the regulatory options considered as the bases for Pretreatment Standards for Existing Sources (PSES) and Pretreatment Standards for New Sources (PSNS) for the Industrial Laundries Point Source Category. Non-water quality environmental impacts are impacts of the regulatory options on the environment that are not directly associated with wastewater. Specifically, EPA evaluated the potential effect of the chemical precipitation of industrial laundry wastewater (CP-IL) and dissolved air flotation of industrial laundry wastewater (DAF-IL) options on energy consumption, air emissions, and generation of solid wastes (oil and sludge). EPA also considered the impacts of the CP-IL and DAF-IL options on water usage and chemical usage. EPA has determined that changes in water usage and chemical usage from the CP-IL and DAF-IL options would be acceptable.

Section 10.2 of this chapter presents the non-water quality environmental impacts of the CP-IL and DAF-IL regulatory options and the methodology used by EPA to evaluate impacts on energy consumption, air emissions, and solid waste generation. Section 10.3 presents the references used.

10.2 Non-Water Quality Environmental Impacts of the CP-IL and DAF-IL Options Considered as the Bases for PSES and PSNS

EPA evaluated the non-water quality environmental impacts that would be associated with implementation of the CP-IL and DAF-IL options considered as the bases for PSES and PSNS for the Industrial Laundries Point Source Category. These options are described in Chapter 8 of this document. Specifically, the following information is presented in this chapter:

- Section 10.2.1 presents the energy consumption impacts that would be associated with PSES;
- Section 10.2.2 presents the air emission impacts that would be associated with PSES;
- Section 10.2.3 presents the solid waste impacts that would be associated with PSES; and
- Section 10.2.4 presents the non-water quality environmental impacts that would be associated with PSNS.

10.2.1 Energy Consumption Impacts

EPA estimates that implementation of a rule would have resulted in a net increase in energy consumption for the industrial laundries industry. The incremental increase is based on electricity used to operate wastewater treatment equipment at facilities that are not currently operating wastewater treatment equipment comparable to the regulatory options.

To calculate incremental energy consumption increases for the industrial laundries industry, EPA examined the wastewater treatment in place at the industrial laundries that would be covered by a regulation. EPA used the industrial laundries cost model, described in Chapter 11 of this document, to calculate the energy that would be required to operate wastewater treatment equipment that would be installed to comply with the regulatory options. EPA used the information provided in the 1994 Industrial Laundries Industry Questionnaire (detailed questionnaire) for the 1993 operating year to determine if a facility would have to install new equipment. If a facility reported operating a treatment system that was not comparable to the regulatory options, EPA estimated the facility’s energy consumption for the reported system and subtracted this consumption from the energy requirements of the regulatory options. Facilities that did not report operating a treatment system comparable to the regulatory options received an incremental energy consumption amount equivalent to the amount estimated for each regulatory option.

EPA extrapolated the energy consumption increases to represent the entire industrial laundries industry using the survey weights. Table 10-1 presents the total incremental energy increase and the average incremental energy increase per facility for the 1,742 existing in-scope industrial laundries. Table 10-1 also presents the percentage of total industry energy use and the percentage of the national energy requirements represented by the incremental increase for each regulatory option. Based on a 1996 survey of industrial laundries conducted by the industry, industrial laundries use approximately 31.2 trillion BTUs per year, or 9.1 billion kilowatt hours per year. Approximately 2,805 billion kilowatt hours of electric power were generated in the United States in 1990 (1).

EPA estimates that the incremental energy consumption increases from the CP-IL and DAF-IL options would be a small percentage of the electricity currently used by the industrial laundries industry to operate all washing, drying, and treatment equipment. Based on this analysis, EPA believes that the energy impacts from these regulatory options would have been acceptable. In addition, industrial laundries can offset the energy impacts of installing additional wastewater treatment equipment by reusing treated hot or warm water. This practice results in energy savings in hot water generation. The use of heat reclaimers at industrial laundries for energy conservation is discussed in Chapter 6 of this document.

Table 10-1

Incremental Energy Consumption Increases Associated With Implementation of the CP-IL and DAF-IL Regulatory Options

PSES Regulatory Option[1]	Incremental Energy Increases[2]		Percentage of Total Industry Use[3]	Percentage of National Energy Requirements[4]
	Total Industry Increase (million kilowatt hours)	Average Increase Per Facility (kilowatt hours)		
CP-IL	69.5	39,900	0.76%	0.0025%
DAF-IL	82.8	47,500	0.91%	0.0030%

[1]Regulatory options are presented in Chapter 8 of this document.
[2]Incremental energy increases are based on 1,742 in-scope industrial laundries. This is a conservative estimate since fewer facilities would have been covered under regulatory options with exclusions (e.g., 1,224 facilities under the 3 Million/120 K exclusion). Chapter 8 of this document discusses the exclusions considered for the regulatory options.
[3]The industrial laundries industry energy use is approximately 9.1 billion kilowatt hours per year, as reported by the industrial laundries trade associations.
[4]Approximately 2,805 billion kilowatt hours of electric power were generated in the United States in 1990 (1).

10.2.2 Air Emissions Impacts

Industrial laundry facilities generate wastewater that contains organic compounds, some of which are on the list of Hazardous Air Pollutants (HAPs) in Title 3 of the Clean Air Act Amendments (CAAA) of 1990. Atmospheric exposure of the organic-containing wastewater may result in volatilization of HAPs, including volatile organic compounds (VOCs). HAPs, including VOCs, are emitted from the wastewater beginning at the point where the wastewater first contacts ambient air. Thus, HAPs, including VOCs, may be emitted prior to and during the cycle and immediately after the washing when the wastewater is discharged from the process unit. Air pollutants are also emitted from wastewater collection units such as process drains, manholes, trenches, and sumps, and from wastewater treatment units such as screens, equalization basins, DAF and chemical precipitation units, and any other units where the wastewater is in contact with the air.

EPA believes that emission of air pollutants from industrial laundry wastewater would have been similar before and after implementation of a rule based on DAF or chemical precipitation technologies because the wastewater from all industrial laundries currently has contact with ambient air as it flows to the publicly owned treatment works (POTW). At facilities that do not currently have treatment on site, the wastewater typically flows from the washers to an open or partially open catch basin, then to the sewer and on to the POTW, where the wastewater is typically treated in open aerated basins or lagoons. Emission of air pollutants from the wastewater occur as the wastewater flows from the facility to the POTW. At a facility with treatment, the wastewater would have more contact with air while still at the facility, as it is treated in open units such as equalization basins and DAF or chemical precipitation units prior to flowing through the sewer to the POTW. Air emissions from the treated wastewater occur at the treatment units at the facility, as well as while the wastewater flows to the POTW. Thus, EPA expects that the location of a portion of air emissions from industrial laundry wastewater would shift from the POTW collection and treatment system to the facility treatment system, but can not determine whether the overall amount of air emissions from industrial laundry wastewater would not change. However, EPA believes that the overall amount may decrease slightly with DAF or chemical precipitation treatment at facilities, since some VOCs and HAPs will partition to the oil fraction or chemical solids removed from the wastewater prior to discharge.

EPA examined the total air emissions from one industrial laundry's untreated wastewater stream assuming all volatile pollutants volatilize from that stream. As a worst-case analysis, EPA considered whether this total amount of air emissions would be acceptable assuming it represented incremental air emissions due to implementation of a rule. (EPA does not believe that the total amount of air emissions, as calculated below, represent incremental air emissions since EPA can not determine that there would be any difference before and after implementation of a rule.) EPA's methodology for estimating fugitive air emissions is described below.

EPA collected and analyzed wastewater samples at seven industrial laundries operating treatment systems that effectively treated industrial laundry wastewater; four of these treatment systems are the bases of the DAF-IL and CP-IL options. At all facilities, total raw wastewater samples were collected. EPA selected the facility with the highest raw wastewater loading of organic pollutants to represent a worst-case scenario. EPA also assumed that all of the organic pollutants in the raw wastewater would volatilize during treatment. EPA believes that this represents a worst-case scenario for the regulatory options because not all of the organic pollutants present in the wastewater are volatile, and those that are volatile would not volatilize completely because they are at least somewhat soluble in water. Based on this methodology, the fugitive air emissions calculated by EPA are much higher than would actually occur at an industrial laundry employing wastewater treatment.

EPA used the following formula to calculate annual fugitive emissions of organic pollutants:

$$Y\frac{\text{Mg}}{\text{year}} = \left(X\frac{\text{mg}}{\text{liter}}\right)\left(F\frac{\text{gallons}}{\text{day}}\right)\left(N\frac{\text{days}}{\text{year}}\right)\left(3.785\frac{\text{liters}}{\text{gallon}}\right)\left(\frac{1\ \text{Mg}}{1\ \times\ 10^{9}\ \text{mg}}\right)$$

where:

Y = megagrams of organic pollutant volatilized per year (Mg/year)
X = average concentration of the organic pollutant in the wastewater (mg/L)
F = average daily wastewater flow rate (gallons/day)
N = average days of operation per year (days/year).

Fugitive emissions were calculated for all volatile and semivolatile organic pollutants of concern. If a pollutant was not detected in the raw wastewater sample, EPA used the detection limit concentration to calculate the fugitive air emissions for that pollutant. Using the average daily flow (203,000 gallons per day), average raw wastewater pollutant concentration, and average days of operation (261 days per year), EPA calculated the fugitive air emission levels presented in Table 10-2. Based on summing the fugitive emissions for each individual HAP, the total annual HAP emissions from this industrial laundry under a worst case analysis would be 14 Mg/year. The total annual emissions for all organics would be 92 Mg/year. The total annual emissions would be 19 Mg/year for volatile organics and 72 Mg/year for semivolatile organics.

EPA estimated the total pounds of carbon dioxide (CO_2) emissions per year based on the incremental energy use to range from 28 million pounds of CO_2 per year (16,000 pounds per year per facility) for the CP-IL option and 33 million pounds of CO_2 per year (19,100 pounds per year per facility) for the DAF-IL option (2). The increased air emissions would be proportional to the increased energy use. As the increase in energy use reflects only a small percentage of the industry’s total energy use, these increased emissions are only a small percentage of the emissions from the industry’s total energy use. Based on this analysis, EPA believes that the incremental air emissions from the CP-IL and DAF-IL options would have been acceptable. Although emissions from greenhouse gases other than CO_2 result from the burning of natural gas to produce energy, CO_2 is believed to be the most significant in terms of the total emission quantity. In addition, the burning of natural gas releases other types of pollutants, such as criteria pollutants and HAPs. Energy produced from the burning of fuels other than natural gas would produce varying quantities of these types of emissions.

Table 10-2

Fugitive Air Emissions of Organic Pollutants From Industrial Laundry Wastewater—Analysis of a Worst-Case Scenario

Organic Air Pollutant	Hazardous Air Pollutant?	Raw Wastewater Concentration (mg/L)	Amount Volatilized (Mg/year)
Volatile Organics			
1,1-Dichloroethane	Y	0.14	0.03
1,1,1-Trichloroethane	N	0.42	0.08
1,4-Dioxane	Y	2.59	0.52
2-Butanone	N	0.73	0.15
2-Chloroethylvinyl Ether	N	1.30	0.26
2-Propanone	N	35.79	7.18
4-Methyl-2-pentanone	N	1.66	0.33
Chlorobenzene	Y	0.65	0.13
Ethylbenzene	Y	2.40	0.48
m-Xylene	Y	14.27	2.86
Methylene Chloride	Y	1.55	0.31
o-&*p*-Xylene	Y	6.36	1.28
Tetrachloroethene	N	15.55	3.12
Toluene	Y	13.17	2.64
trans-1,2-Dichloroethene	N	0.04	0.01
Trichloroethene	N	0.04	0.01
Trichlorofluoromethane	N	0.04	0.01
Subtotal for Volatile Organics			**19.40**
Semivolatile Organics			
1,2-Diphenylhydrazine	Y	0.20	0.04
2,3,6-Trichlorophenol	N	0.10	0.02
2,4,5-Trichlorophenol	Y	0.10	0.02
2,4,6-Trichlorophenol	Y	0.10	0.02
2,4-Dichlorophenol	N	0.10	0.02
2,4-Dimethylphenol	N	0.10	0.02
2,4-Dinitrophenol	Y	0.50	0.10
2-Chlorophenol	N	0.10	0.02
2-Methylnapthalene	N	0.10	0.02
2-Nitrophenol	N	0.20	0.04
4-Chloro-3-methylphenol	N	0.16	0.03

Table 10-2 (Continued)

Organic Air Pollutant	Hazardous Air Pollutant?	Raw Wastewater Concentration (mg/L)	Amount Volatilized (Mg/year)
Semivolatile Organics (Continued)			
4-Nitrophenol	Y	0.50	0.10
∝-Terpineol	N	0.10	0.02
Benzoic Acid	N	0.66	0.13
Benzyl Alcohol	N	0.10	0.02
Bis(2-ethylhexyl) Phthalate	Y	19.11	3.83
Bromodichloromethane	N	0.04	0.01
Butyl Benzyl Phthalate	N	0.48	0.10
Diethyl Phthalate	N	0.10	0.02
Dimethyl Phthalate	Y	0.10	0.02
Di-*n*-butyl Phthalate	N	1.23	0.25
Di-*n*-octyl Phthalate	N	0.10	0.02
Hexanoic Acid	N	0.10	0.02
Isophorone	Y	0.10	0.02
Naphthalene	Y	6.43	1.29
n-Decane	N	277.97	55.74
n-Docosane	N	1.74	0.35
n-Dodecane	N	11.13	2.23
n-Eicosane	N	5.13	1.03
n-Hexacosane	N	1.19	0.24
n-Hexadecane	N	13.47	2.70
n-Nitrosomorpholine	Y	0.10	0.02
n-Octadecane	N	4.73	0.95
n-Tetracosane	N	4.14	0.83
n-Tetradecane	N	11.88	2.38
p-Cymene	N	0.19	0.04
Pentachlorophenol	Y	0.50	0.10
Pentamethylbenzene	N	0.84	0.17
Phenol	Y	0.10	0.02
Phenol, 2-Methyl-4, 6-Dinitro	N	0.20	0.04
Styrene	Y	0.17	0.03
Subtotal for Semivolatile Organics			**73.07**
Total for Volatile and Semivolatile HAPs			**13.86**
Total for All Volatiles and Semivolatiles			**92.47**

10.2.3 Solid Waste Impacts

EPA considered regulatory options based on DAF and chemical precipitation technologies followed by dewatering of the sludge generated from these technologies. Based on information collected in the industrial laundries detailed questionnaire and from data submitted in comments, most industrial laundry sludge from chemical precipitation or DAF treatment systems is disposed in nonhazardous landfills. EPA estimated the incremental sludge generation from the CP-IL and DAF-IL options in a manner similar to estimating the energy consumption incremental amounts. EPA estimated that sludge generation would not increase at facilities that reported currently operating a treatment system comparable to the regulatory options. EPA used the cost model to estimate the incremental sludge generation rates for facilities not currently operating wastewater treatment and for facilities operating wastewater treatment not comparable to the regulatory options.

EPA calculated the volume of sludge that would be generated by the 1,742 in-scope industrial laundries after implementation of the CP-IL and DAF-IL options. Table 10-3 presents the incremental increase in sludge generation (in wet sludge and dry solids) from all existing in-scope industrial laundries. Table 10-3 also presents the average incremental increase per industrial laundry and the percentage of the national volume of nonhazardous waste sent to landfills represented by the incremental increase for each regulatory option. Approximately 430 million tons (dry basis) of industrial nonhazardous waste was sent to landfills in the United States in 1990 (3). EPA notes that this volume would be offset somewhat by reducing the volume generated by POTWs. Based on this analysis, EPA believes the solid waste impacts of all of the regulatory options under consideration would have been acceptable.

10.2.4 Non-Water Quality Environmental Impacts of the Regulatory Options Considered for PSNS

EPA considered the non-water quality environmental impacts associated with the implementation of the CP-IL and DAF-IL regulatory options, which were considered for PSNS for the Industrial Laundries Point Source Category. Over a three-year period (1991, 1992, and 1993), according to the detailed questionnaire, only about 80 new laundry facilities began operation (and it is not absolutely clear from the data whether these facilities were new dischargers or were existing dischargers acquired in that year by a different firm). Given the small level of growth in the industrial laundries industry, EPA believes that new sources are primarily replacing production from closing facilities that exit the market. With respect to any new sources that start in the future, the non-water quality environmental impacts of compliance with a rule would not be any greater than those for existing sources. Therefore, EPA has determined that the non-water quality environmental impacts associated with the implementation of the regulatory options considered for PSNS would have been negligible.

Table 10-3

Incremental Sludge Generation Increases Associated With Implementation of the CP-IL and DAF-IL Regulatory Options

PSES Regulatory Option Considered for Proposal[1]	Incremental Sludge Generation Increases[2]				Percentage of National Volume of Waste Disposed to Nonhazardous Industrial Landfills[4]
	Total Industry Increase (Tons of Dewatered Sludge)	Total Industry Increase (Tons of Dry Solids)[3]	Average Facility Increase (Tons of Dewatered Sludge)	Average Facility Increase (Tons of Dry Solids)[3]	
CP-IL	173,000	60,600	99.5	34.8	0.014%
DAF-IL	128,000	70,600	73.7	40.6	0.016%

[1]Regulatory options are presented in Chapter 8 of this document.
[2]Incremental sludge generation increases are based on 1,742 industrial laundries in-scope industrial laundries. This is a conservative estimate since fewer facilities would have been covered under regulatory options with exclusions (e.g., 1,224 facilities under the 1 Million/255 K exclusion). Chapter 8 of this document discusses the exclusions considered for the regulatory options.
[3]Industrial laundries responding to the detailed questionnaire that currently treat their wastewater through DAF or chemical precipitation reported an average solids content of their dewatered sludge of 55% and 35%, respectively.
[4]Approximately 430 million tons (dry basis) of industrial nonhazardous waste was sent to landfills in the United States in 1990 (3).

10.3 References

1. Steam, Its Generation and Uses, 4th Edition, Babcock & Wilcox, Ed Stutz & Kitto, Barberton, Ohio. 1992.

2. U.S. Environmental Protection Agency. AP-42, Fifth Edition, Volume 1, 1998.

3. U.S. Environmental Protection Agency. Subtitle D Study Phase I. EPA 530-SW-86-054. Washington, DC, 1986.

CHAPTER 11

COSTS OF TECHNOLOGY BASES FOR REGULATORY OPTIONS

11.1 Introduction

This chapter describes the methodology used to estimate the costs to implement each of the regulatory options considered for the final action for the Industrial Laundries Point Source Category. Chapters 6 and 8 of this document describe in detail the technologies used as the bases for the regulatory options considered. The cost estimates provide a basis for determining the economic impact of implementing the options on the industry. The results from assessing the economic impact of the regulatory options are found in the Economic Assessment (EA) for the industrial laundries final action (1). The cost estimates, together with the pollutant reduction estimates described in Chapter 9 of this document, also provide a basis for evaluating the cost-effectiveness of the options.

EPA used the following approach in estimating compliance costs for the industrial laundries industry:

- EPA mailed the 1994 Industrial Laundries Industry Questionnaire (detailed questionnaire) to a statistically selected sample of industrial laundries (discussed in Chapter 3 of this document). The information provided for the 1993 operating year from the 190 in-scope facilities that responded was used to determine baseline wastewater treatment system design and operating status. The in-scope facilities are those that launder industrial textile items from off site as a business activity, as discussed in Chapter 4 of this document.

- EPA identified candidate end-of-pipe wastewater treatment technologies and grouped appropriate technologies into technology control options (discussed in Chapters 6 and 8 of this document).

- EPA analyzed data collected from industry to determine untreated wastewater pollutant concentrations and pollutant removal performance of the technology control options (discussed in Chapter 9 of this document).

- EPA developed cost equations for capital and operating and maintenance (O&M) costs for each of the technologies included in the technology control options based on information gathered from industrial laundry facilities, wastewater treatment system vendors, and engineering judgement (discussed in this chapter).

- EPA developed and used a computerized design and cost model, the Industrial Laundries Design and Cost Model (cost model), to calculate capital and annual compliance costs (presented in this chapter) and pollutant loadings (presented in Chapter 9 of this document) for each technology control option for each facility.

- EPA used output from the cost model to calculate total annualized costs in 1993 dollars for each facility for each regulatory option (presented in the EA).

- EPA compared each facility's annualized cost for each regulatory option to the annualized cost for the facility to contract for off-site wastewater treatment (presented in this chapter). If the cost for off-site treatment was less than the cost to install and operate an on-site treatment system, the off-site treatment cost was used as the facility's cost for compliance.

- EPA used the annualized costs and the pollutant loadings calculated by the cost model to calculate cost-effectiveness and the economic impact of each regulatory option on the industry (presented in the EA).

EPA estimated compliance costs for all technology control options presented in Chapter 8 of this document. These cost estimates may be found in the Industrial Laundries Administrative Record. This chapter presents the methodology, assumptions, and cost estimates for the two regulatory options, DAF-IL and CP-IL. EPA estimated industry-wide costs by estimating compliance costs for the 190 in-scope facilities to purchase, install, and operate each of the options. Using statistically calculated facility weighting factors, EPA then extrapolated the results to the entire industrial laundries industry (1,742 industrial laundries). EPA also estimated industry-wide costs for three exclusions (discussed in Chapter 8 of this document) for each of the two regulatory options.

The following information is discussed in this section:

- Section 11.2 discusses the costing methodology;

- Section 11.3 discusses cost modeling and summarizes cost estimating assumptions and design bases for the technologies that comprise the regulatory options;

- Section 11.4 presents the cost estimates for each regulatory option;

- Section 11.5 presents the cost estimates for each regulatory option estimated from updated wastewater treatment information provided in a 1998 survey conducted by the industrial laundries trade associations; and

- Section 11.6 presents the references used in this chapter.

11.2 Costing Methodology

To determine the impact of pretreatment standards on the industrial laundries industry, EPA estimated costs associated with regulatory compliance. A computerized cost model was developed to estimate compliance costs for each of the regulatory options. EPA used the cost model to estimate costs for the treatment technologies used as the bases for the calculated limitations of each regulatory option. Although the estimated compliance costs were developed based on implementation of these treatment technologies, EPA emphasizes that a regulation would not require that a facility operate these technologies, but only that the appropriate facility effluent standards be met.

EPA selected a facility-by-facility model approach to develop the compliance costs as opposed to a more general modeling approach, because of the variability of processes and resultant wastewaters among industrial laundries. EPA used facility information available from responses to the detailed questionnaire to characterize the wastewater and assess existing treatment technologies at each facility. EPA did not include information from facilities that did not provide sufficient technical and/or economic data to be adequately characterized as to their current operations and/or economic status, respectively. For the purposes of the cost model, a facility was excluded if EPA did not have information on its flow, production, and/or wastewater treatment activities.

In other cases when more specific information was not available, EPA made engineering assumptions regarding facility operations, or used industry average data and various wastewater treatment equipment vendor and consultant information. Thus, for any given facility, the costs estimated may deviate from those that the facility would actually incur. However, because EPA based these assumptions on industry-wide data, the resulting estimates are considered accurate when evaluated on an industry-wide, aggregate basis.

As discussed in Chapter 8 of this document, EPA identified the following regulatory options:

- <u>DAF-IL Option</u> - Dissolved air flotation (DAF) treatment of wastewater generated from the washing of industrial textile items only; the cost model uses target average concentrations calculated from data obtained from the industry for DAF treatment of a facility's total process wastewater stream to calculate pollutant removals for the DAF-IL option.

- <u>CP-IL Option</u> - Chemical precipitation treatment of wastewater generated from the washing of industrial textile items only; the cost model uses target average concentrations calculated from data obtained from the industry for chemical precipitation treatment of a facility's total process wastewater stream to calculate pollutant removals for the CP-IL option.

Also as discussed in Chapter 8 of this document, EPA identified three exclusions for each of the technology options:

- 1 Million/255 K—Facilities processing less than 1,000,000 pounds of incoming laundry and less than 255,000 pounds of industrial towels annually are excluded;

- 3 Million/120 K—Facilities processing less than 3,000,000 pounds of incoming laundry and less than 120,000 pounds of industrial towels annually are excluded (this exclusion also excludes all facilities excluded under the 1 Million/255 K exclusion, above); and

- 5 Million/255 K—Facilities processing less than 5,000,000 pounds of incoming laundry and less than 255,000 pounds of industrial towels annually are excluded.

11.2.1 Cost Model Development and Structure

EPA evaluated the following three existing cost models from other EPA effluent guidelines development efforts to be used as the basis for the industrial laundries cost model:

- Metal Products and Machinery (MP&M) Phase I Industries Design and Cost Model;

- Pharmaceuticals Industry Cost Model; and

- Pesticides Formulating, Packaging, and Repackaging Industry (PFPR) Cost Model.

The MP&M and pharmaceuticals cost models were programmed in FoxPro®. These cost models have treatment technology “modules” designed to calculate the cost of each individual treatment technology. The individual modules are tied together with the cost model “driver,” the main program that accesses input data, runs the modules in the appropriate order for each regulatory option, and tracks intermediate and output data. The PFPR cost model was programmed in a spreadsheet, but also designed with individual modules. Because FoxPro® provided a more flexible platform than a spreadsheet on which to build the cost model and because the data for the industrial laundries project were already stored in FoxPro® files, EPA decided to use FoxPro® for the industrial laundries cost model.

The industrial laundries cost model driver was based on the MP&M cost model driver. The major advantage of the MP&M cost model driver over the pharmaceuticals cost model driver is its ability to calculate the baseline pollutant loads and the postcompliance pollutant loads along with the costs for regulatory options. The pharmaceuticals cost model driver was not programmed to calculate pollutant loads.

EPA adapted the MP&M cost model driver for the industrial laundries cost estimation effort with one major modification: any value calculated by the cost model is stored in an output file. This allows the user of the cost model to examine the significance of each calculated value in the cost calculated for each technology module.

The inputs to the industrial laundries cost model include untreated wastewater pollutant concentrations, flow rates, operating schedules, and treatment technologies currently in place for each facility costed. EPA obtained facility information on the flow rates, operating schedules, and treatment technologies in place for the 1993 operating year from the detailed questionnaire response for each facility. As described previously, facilities that did not report flow, production, and/or treatment technology information were not included in the cost estimation effort. If facilities did not report operating days per year or hours per day, facility average data were used. EPA calculated the untreated wastewater pollutant concentrations for each facility costed using wastewater characterization data obtained from the industry and each facility's production data provided in the detailed questionnaire, as described in Chapter 9 of this document. The input information for the cost model was maintained in database files. Section 11.3 of this document discusses the cost model and its operation in more detail.

11.2.2 Components of the Cost of Compliance

EPA adjusted all costs calculated by the cost model to 1993 dollars because all facility-specific information in the detailed questionnaire database is from the 1993 operating year. This adjustment allows direct comparison between financial data reported in the detailed questionnaire and calculated compliance costs for each facility. Costs were adjusted using the Chemical Engineering (CE) Plant Cost 1993 annual index value of 359.2 (2) and the index value for the year in which the costs were originally reported in the following formula:

$$AC = OC\left(\frac{359.2}{OCI}\right)$$

where:

AC	=	Adjusted cost, 1993 dollars
OC	=	Original cost, dollars
OCI	=	Original cost year index.

EPA used the cost model to calculate capital and annual operating and maintenance (O&M) costs for each technology included in the regulatory option and to sum the capital and annual O&M costs for all technologies in the option at each facility.

Capital costs comprise direct and indirect costs associated with the purchase and installation of wastewater treatment equipment. Primary sources of the capital costs were vendor information and literature references. Table 11-1 presents the unit capital costs used by the cost model and includes references for the origin of each cost. Typically, direct capital costs include the following:

- Purchase of treatment equipment and any accessories;
- Purchase of treatment equipment instrumentation (e.g., controllers);
- Installation costs (e.g., labor and rental fees for equipment such as cranes);

Table 11-1

Capital Unit Costs Used by the Cost Model

Capital Costs (includes crane rental)			
Item	**Cost (1993 $s)**	**Module(s)**	**Reference**
Air-operated sludge pump (4 to 60 gpm)	Cost = 571.91 + 37.161 × C - 0.18842 × C^2 per pump (C = Capacity in gpm)	Pump	(8)
Batch chemical precipitation treatment units (100 to 2,500 gallons)	Cost = 23,773 + 19.963 × V - (2.8223 × 10^{-3}) × V^2 per unit (V = batch size in gallons)	Chemical Precipitation	(16)
Building	$40.32 per square foot	Building	(20)
C-Clamp-mounted agitators (0.25 to 2 hp)	Cost = 3,168.998 + 2965.115 x log(P) per agitator (P = power requirement in hp)	pH Adjustment	(19)
Centrifugal wastewater transfer pumps (> 27 gpm)	Cost = 2,758.989 × $\log_{10}$ (C) - 2,185.941 per pump (C = capacity in gpm)	Pump	(8)
Chemical feed system (0.01 to 3,200 lb/hr)	Cost = 12,421 + 38.142 × C - (3.8125 × 10^{-3}) × C^2 per unit (C = Capacity in lbs/gal)	DAF, pH Adjustment	(14, 19)
Continuous chemical precipitation treatment units (2 to 150 gpm)	Cost = 47,192 + 1,129.6 × C - (1.3255 × C^2) per unit (C = capacity in gpm)	Chemical Precipitation	(16)
Continuous DAF treatment units (25 to 1,000 gpm)[1]	Cost = 111,370 × $\log_{10}$ (C) - 139,260 per unit (C = capacity in gpm)	DAF	(14)
Covered and flanged fiberglass tanks (110 to 50,000 gallons)	Cost = 2,839.2 + 0.9004 × V per tank (V = volume in gallons)	Contract Haul	(22)
Covered and flanged fiberglass tanks (110 to 50,000 gallons)	Cost = 2,927.1 + 0.9182 × V per tank (V = volume in gallons)	Equalization	(11)
Equipment and labor required for washer modification for split stream capability	$4,096.61 to $7,599.37 per washer	Stream Splitting	(7)
Filter press (5 to 125 ft^3)	Cost = 33,331 x ln(C) - 36,195 per press (C = capacity in ft^3)	Sludge Dewatering	(17)
Flange-mounted agitators (0.25 to 5 hp)	Cost = 4,247.414 + 2,616.527 × $\log_{10}$ (P) per agitator (P = power requirement in hp)	Equalization, pH Adjustment	(11, 19)
Installation labor rate	$25.27 per hour	All	(3)

Table 11-1 (Continued)

Capital Costs (includes crane rental)			
Item	**Cost (1993 $s)**	**Module(s)**	**Reference**
Open polyethylene tank (55 to 6,400 gallons)	Cost = 362.48 + 1.5907 × V - (1.0583 × 10^{-4}) × V^2 per tank (V = Volume in gallons)	Screen, pH Adjustment	(9, 19)
pH controller	$1,554.77 per controller	pH Adjustment	(19)
Positive displacement wastewater transfer pumps (<3 to 27 gpm)	$839.38 to $2,130.04 per pump	Pump	(8)
PVC piping for stream segregation retrofit[2]	$27.08 per foot	Stream Splitting	(7)
Shaker screen unit (48-inch and 60-inch units)	$8,131.76 to $9,542.93 per unit	Screen	(9)
Optimization Cost Allowance			
Item/Activity	**Cost (1993 $s)**	**Module(s)**	**Reference**
Increased equalization capacity	$3,693 to $23,558	---	(6)
Training and consulting	$4,800	---	(6)

[1]The same DAF unit (750 gpm) will be costed for capacities ranging within 750 to 1,000 gpm, as this size unit is capable of treating up to 1,000 gpm of wastewater flow.
[2]An additional $500 per facility was allowed to account for any necessary elbow joints or other connections.

DAF - Dissolved air flotation.

- Construction of buildings or other structures to house major treatment units (e.g., foundation slab, enclosure, containment, lighting, and electricity hook-ups); and

- Purchase of necessary pumps (e.g., for wastewater transfer, chemical addition, sludge handling).

EPA obtained the wage rate for all required labor to properly install the systems associated with the technology bases from The Richardson Rapid System Process Plant Construction Estimating Standards (3) as the average hourly rate for one installation worker. The average rate in 1994 was $25.90 per hour. This rate was scaled back to a 1993 rate of $25.27 per hour using the CE Plant Cost indices.

Indirect capital costs typically include the following:

- Purchase and installation of necessary piping to interconnect treatment system units (e.g., pipe, pipe hangers, fittings, valves, insulation, similar equipment);

- Purchase and installation of electrical equipment (e.g., switches, wire, fittings, grounding, instrument and control wiring, lighting panels);

- Engineering costs (e.g., administrative, legal, process design and general engineering, communications, consultant fees, travel, supervision, and inspection of treatment equipment);

- Site maintenance (e.g., roads, walkways, fences, parking areas, landscaping, site clearing);

- Contingency (e.g., compensation for unpredictable events such as foul weather, price changes, small design changes, and errors in estimates); and

- Contractors' fees.

For each technology, EPA accounted for each required indirect capital cost by using a factor related to purchased and installed capital costs. The total capital investment is obtained by multiplying the direct capital cost by the indirect capital cost factor. Table 11-2 presents the components of the total capital investment, including the indirect capital cost factor used by the cost model.

Table 11-2

Components of Total Capital Investment

Number	Component	Cost
1	Equipment capital costs, including required accessories, installation, delivery, instrumentation, building, containment, pumping	Direct Capital Cost
2	Piping	10% of the Direct Capital Cost
3	Electrical	2% of the Direct Capital Cost
4	Engineering/administrative/legal services	10% of the Direct Capital Cost
5	Total Plant Cost	1.22 × Direct Capital Cost (Sum of Components 1 through 4)
6	Site Work	1.5% of the Total Plant Cost
7	Contingency	13% of the Total Plant Cost
8	Contractor's Fee	5% of the Total Plant Cost
9	**Total Capital Investment**	1.46 × Direct Capital Cost (Sum of Components 5 through 8)

Source: Industrial Laundries Design and Cost Model.

Annual O&M costs comprise all costs related to operating and maintaining the treatment system for a period of one year, including the estimated costs for compliance monitoring of the effluent. Table 11-3 presents the annual O&M unit costs used by the cost model and includes references for the origin of each cost. Annual O&M costs include the following:

- Chemical usage;
- O&M labor and materials;
- Removal, transportation, and disposal of any waste solids, sludges, oils, or other waste products generated by the treatment system; and
- Utilities, such as electricity, required to run the treatment system.

Sources of annual O&M costs primarily included literature references and vendor information. Information from other EPA effluent guidelines development efforts and engineering judgement were used in some instances when estimating O&M labor.

At proposal, assumptions on the number of hours required of a worker to operate a treatment system were made for each piece of equipment included in the treatment system for each regulatory option. EPA also assumed that an industrial laundry treatment system operator received an equivalent rate of pay as an installation worker. However, based on comments received and industry-supplied data, EPA simplified how it estimated the annual O&M labor costs for each option. Annual O&M labor costs were estimated to be equivalent to one full-time operator paid at a rate of $13.77 per hour for each facility that did not report having treatment (4).

EPA obtained the cost for electricity used by various treatment technologies from the Department of Energy's Monthly Energy Review (5). The average cost of electricity for industrial facilities for the year 1993 was $0.049 per kilowatt-hour.

11.2.3 Treatment-in-Place Credit Methodology

EPA evaluated facility responses to the detailed questionnaire to determine which treatment technologies were in place and in operation at each facility in the 1993 operating year. Facilities were given credit for having operational treatment in place; these treatment credits were used to develop cost estimates for system upgrades instead of new systems where appropriate. No compliance costs beyond necessary additional monitoring and an optimization cost allowance (discussed in Section 11.2.4 of this document) were estimated for facilities that were determined to have treatment equivalent to an option currently in use. EPA's methodology for crediting facilities for existing treatment on site is discussed below.

Table 11-3

Operation and Maintenance Unit Costs Used by the Cost Model

Activities			
Activity	**Cost (1993 $s)**	**Module(s)**	**Reference**
Compliance monitoring lab fee	$20,200 per year	Compliance Monitoring	(22)
Contract hauling of bulk wastewater	$537 per full load (5,000 gallons bulk liquid)	Contract Haul	(21)
Monitoring fee for contract hauled wastewater	$200 per year	Contract Haul	(21)
Nonhazardous dewatered sludge disposal	$2.12 per cubic foot	Sludge Dewatering	(17)
Treatment fee for contract hauled wastewater	$0.35 per gallon	Contract Haul	(21)
Chemicals			
Chemical	**Cost (1993 $s)**	**Module(s)**	**Reference**
Anionic polymer	$2.48 per pound	DAF, Chemical Precipitation	(14, 16)
Cationic polymer	$1.34 per pound	DAF, Chemical Precipitation	(14, 16)
Ferric chloride	$0.49 per pound	DAF	(14)
Hydrated lime	$67.50 per ton	Chemical Precipitation	(16)
Perlite	$0.63 per pound	DAF	(14)
Quick lime	$45 per ton	Chemical Precipitation	(16)
Sodium hydroxide (50%)	$0.138 per pound	pH Adjustment	(19)
Sulfuric acid (93%)	$75 per ton	DAF, pH Adjustment	(14, 19)
Equipment			
Equipment	**Cost (1993 $s)**	**Module(s)**	**Reference**
Agitator maintenance and materials cost	3% of the direct capital cost of agitator per year	Equalization, pH Adjustment	(11, 19)
Air-operated sludge pump maintenance and materials cost	1% of the direct capital cost of pump per year	Pump	(8)
Building maintenance and materials cost	3.5% of the direct capital cost of the building per year	Building	(10, 20)
Chemical feed system materials maintenance and cost (0.01 to 3,200 lb/hr)	Cost per year = $201.99 + 0.1329 \times C - (3 \times 10^{-5}) \times C^2$ (C = Capacity in pounds per hour)	DAF, pH Adjustment	(14, 19)

Table 11-3 (Continued)

Equipment (Continued)			
Equipment	**Cost (1993 $s)**	**Module(s)**	**Reference**
Compliance monitoring materials cost	$248.83 per year	Compliance Monitoring	(22)
Continuous/batch chemical precipitation treatment unit maintenance and materials cost	3% of the direct capital cost of the chemical precipitation unit per year	Chemical Precipitation	(16)
Continuous DAF treatment unit maintenance and materials cost	1% of the direct capital cost of the DAF unit per year	DAF	(13, 14)
Positive displacement or centrifugal pump maintenance and materials cost	1% of the direct capital cost of pump per year	Pump	(8)
Reaction tank maintenance and materials cost	3% of direct capital cost of tank per year	Equalization, pH Adjustment	(11, 19)
Replacement pH probe	$276.79 per probe	pH Adjustment	(19)
Replacement plates for 48-inch and 60-inch shaker screen units	$410.22 to $608.25 per plate replaced every two years	Screen	(9)
Replacement porous collection bags for shaker screen lint	$200 per year	Screen	(9)
Replacement screens for 48-inch and 60-inch shaker screen units	$174.46 to $257.45 per screen replaced twice per year	Screen	(9)
Replacement sliders for 48-inch and 60-inch shaker screen units	$94.30 to $141.45 per screen	Screen	(9)
Storage tank maintenance and materials cost	1% of direct capital cost of tank per year	Screen	(9)
Wastewater storage tank maintenance and materials cost	5% of direct capital cost of tank per year	Contract haul	(21)
Optimization Cost Allowance			
Activity	**(Cost (1993 $s)**	**Module(s)**	**Reference**
Increased DAF chemical usage	$406 to $15,519 per year	---	(6)
Increased chemical precipitation chemical usage	$518 to $14,070 per year	---	(6)
Increased sludge disposal	$150 to $4,881 per year	---	(6)
General Costs			
Item	**(Cost (1993 $s)**	**Module(s)**	**Reference**
O&M labor rate	$13.77 per hour	All	(4)
Electricity usage fee	$0.049 per kilowatt-hour	All	(5)

DAF - Dissolved air flotation.

- Stream splitting - EPA gave stream-splitting credit to facilities that indicated that a portion of their wastewater was segregated for treatment, regardless of the specific method used to segregate the stream.

- Mechanical fine screen (i.e., a shaker or rotary screen) - EPA gave full screen credit to facilities that had screens in place that treated at least a portion of the facility's wastewater under the assumption that the screen was adequate to treat a larger amount of wastewater for the purposes of the IL options.

- Adequate equalization capacity - EPA gave facilities the following credits: full credit for mixed tanks having a minimum residence time (two hours); partial credit for unmixed tanks having at least the minimum residence time (costs for agitators were added); no credit to facilities having tanks with less than the minimum residence time; and full credit for an agitator if facilities indicated that they had one on site.

- Key treatment units (i.e., DAF, or chemical precipitation) - EPA gave facilities full option credit if they indicated that they had the respective key treatment unit in place. EPA used certain assumptions and specific criteria to determine the presence of the key treatment units; Section 11.3 of this document discusses these assumptions and criteria further.

- DAF treatment unit (applicable to the CP-IL option) - EPA estimated a salvage value for DAF units currently in place at industrial laundries, based on the reported age of the equipment and estimated capital cost. EPA also estimated the annual DAF O&M cost for each facility. The salvage value and annual cost for the DAF unit were then credited toward the capital and annual costs, respectively, that were calculated for the chemical precipitation unit as part of the costs for compliance under the CP-IL regulatory option.

  A lower indirect capital cost factor was also applied toward the installation of the chemical precipitation unit at these facilities. EPA assumed that facilities that are replacing an existing piece of equipment would not incur some of the site preparation and auxiliary equipment (e.g., piping and electrical hookups) costs that are included in the indirect cost factor, as described in Section 11.2.2 of this document. Section 11.3 further discusses this treatment-in-place cost estimate. Table 11-4 presents the modified components of the total capital investment for facilities with DAF treatment.

Table 11-4

Components of Total Capital Investment Estimated for DAF Facilities in the CP-IL Regulatory Option

Number	Component	Cost
1	Chemical precipitation equipment capital costs including required accessories, installation, delivery, instrumentation, and pumping	Direct Capital Cost
2	Piping	2% of the Direct Capital Cost; assumed a chemical precipitation unit will use existing piping, but some adjustment may be required
3	Electrical	Not included; assumed chemical precipitation unit will use existing connections
4	Engineering/administrative/legal services	10% of the direct capital cost
5	Total Plant Cost	1.12 x Direct Capital Cost (Sum of Components 1 through 4)
6	Site Work	Not included, assumed no additional site work will be required in replacing DAF unit with chemical precipitation unit
7	Contingency	13% of the Total Plant Cost
8	Contractor’s Fee	3.25% of the Total Plant Cost; assumed an average fee (rather than a maximum fee, as in Table 11-2) since replacement of an existing treatment unit is less complicated than installation of a new treatment system
9	**Total Capital Investment**	**1.30 x Direct Capital Cost (Sum of Components 5 through 8)**

- Sludge dewatering devices - EPA gave facilities full sludge dewatering credit if they indicated that their sludge dewatering device treated sludge generated by either DAF or chemical precipitation; facilities that indicated that they treat their sludge with a conditioner received full sludge conditioning credit in the DAF-IL regulatory option.

- pH adjustment (applicable to the CP-IL regulatory option only) - EPA gave facilities the following credits: full credit for pH adjustment with no minimum residence time required if they indicated that they have a mixed tank with chemical addition; and partial credit for a tank, an agitator, an acid/base feed system, or some combination of these three components (these facilities were costed only for the missing component(s)).

- Space inside of the facility - EPA costed facilities for a building of adequate size to house the regulatory option equipment only if they indicated that they did not currently have space inside; no partial credit was given.

- Monitoring costs - EPA gave facilities either full or partial credit based on whether the facilities reported that they monitor their wastewater effluent.

11.2.4 Optimization Cost Allowance

In the costing performed for the proposed rule, EPA assumed that facilities with treatment equipment in place equivalent to one of the regulatory options could meet the proposed pretreatment standards without any additional costs other than compliance monitoring costs. Based on comments received on the proposed rule, EPA decided to provide an optimization cost allowance for facilities with full option treatment-in-place credit to allow for the possibility that those facilities may need to make minor capital improvements to the treatment system in order to meet the proposed pretreatment standards. Facilities may incur an increased annual O&M cost for optimizing system performance, as well.

EPA estimated the cost allowance for these facilities based on assumptions about the most common types of upgrades that facilities would need to implement to improve the performance of existing treatment systems. The assumptions are based on EPA's observations from over 35 site visits and nine sampling episodes at industrial laundries, as well as numerous conversations with industrial laundry personnel throughout the development of a regulation. Although EPA used specific cost components to develop the cost allowance, the cost is intended to be an allowance for any type of upgrade that an individual facility would identify as necessary to optimize treatment system performance.

EPA's capital cost allowance is based on: 1) increasing the equalization capacity; 2) additional operator training; and 3) the cost of an engineering consultant to provide advice on optimizing treatment system performance. EPA's estimated annual cost allowance is based on 1) increased chemical addition and 2) increased sludge disposal costs. The cost allowances were based on the average of the costs calculated for chemical precipitation and DAF and applied to all facilities with either technology in place (6).

11.3 Cost Modeling

11.3.1 Cost Model Driver

As described earlier, EPA developed a computerized design and cost model to estimate compliance costs and pollutant loadings for the industrial laundries technology control options, taking into account each facility's treatment in place. The cost model was programmed with modules that allowed the user to specify various combinations of technologies and practices to be costed as required by each technology control option. In the context of the industrial laundries cost estimation effort, "cost model" refers to the overall computer program and "module" refers to a computer subroutine that generates costs and pollutant loadings for a specific technology or practice (e.g., chemical precipitation, contract hauling). Some modules were adapted from cost models used for previous EPA rulemaking efforts, such as MP&M, while others were developed specifically for this rulemaking.

EPA developed cost modules for the wastewater treatment technologies and practices, as well as auxiliary components of these technologies (e.g., pumps, buildings) included in the industrial laundries technology control options. Chapter 8 of this document discusses in greater detail the specific combinations of these technologies into the technology control options. As stated previously, this chapter discusses the estimation of compliance costs for the two regulatory options, DAF-IL and CP-IL. The technologies, components, and practices that compose the regulatory options are listed below:

- Wastewater and sludge transfer pumps;
- Buildings;
- Stream splitting;
- Mechanical screening;
- Equalization;
- Dissolved air flotation;
- Chemical precipitation;
- Sludge dewatering;
- pH adjustment; and
- Contract hauling of untreated wastewater.

As discussed in Section 11.2.1, EPA developed a cost model driver to organize the treatment technology modules and track the costs for the entire industry. The cost model driver performs the following functions, as applicable, for each technology designed for a facility:

- Locates and opens all necessary input data files;

- Stores input data entered by the user of the cost model;

- Opens and runs each of the technology modules in the appropriate order for each option;

- Calculates and tracks the following types of information generated by each technology module:

  - Total direct capital costs;
  - Total direct annual costs;
  - Electricity used and associated cost;
  - Sludge generation and associated disposal costs;
  - Effluent flow rate; and
  - Effluent pollutant concentrations; and

- Sends tracked costs by regulatory option to a storage file that may be printed or maintained in electronic form for further manipulation.

The following sections list the major technologies included as modules within the cost model and describe the major assumptions and costing methodology used for each.

11.3.2 Stream Splitting

EPA estimated costs for a facility to install and operate a means of segregating wastewater streams generated from washing specific items. Stream splitting was costed in order for each facility to direct all wastewater generated from the washing of industrial textile items to the wastewater treatment system, while allowing the facility to discharge wastewater generated from the washing of nonindustrial textile items (i.e., linen items) to the sewer without treatment. The costs generally comprised the retrofitting of existing washers to include dual valves for discharging wastewater to separate conduits and the costs associated with operating and maintaining these valves. The costs also included a means to divide the facility's existing trench and sump system and direct the wastewater flows to separate locations.

Capital and annual costs for the following equipment were included in the stream-splitting module:

- Retrofitting of existing washers with dual valves and associated control equipment; and

- Piping and pumping of wastewater to be treated to the treatment system.

Direct capital costs were dependent upon the required size for the dual-valve fitting, which was determined based on the facility-reported size of washer(s) and assumptions regarding the number of washers to be retrofitted. EPA assumed that no additional annual costs would be associated with the operation of dual-valves on existing machines. It was assumed that all facilities had in place a trench and sump system, since that is the method used in industrial laundries to transport process wastewater to the sewer. If a facility did not report that it segregates its wastewater, costs were calculated for the required sized valve(s), 200 feet of PVC piping, and other connections necessary to direct the wastewater to be treated to the first unit of the treatment system (i.e., the equalization tank). If a facility indicated that it segregates its wastewater, the cost model calculated a zero capital and annual cost for stream splitting for that facility.

It was estimated by the equipment vendor that it would take one worker three to four days to install the valves, pipes, and pumps for the stream-splitting process. It was also estimated that another 30 minutes would be required for each washer formula to be programmed (7). Based on site visits, EPA assumed that a typical washer controller contains 15 formulae, amounting to 7.5 hours of programming time per washer. These estimates are included as part of the installation labor cost for stream splitting.

The cost for an air-operated sludge pump to transfer the industrial laundry wastewater to the equalization tank, including the necessary installation and operating labor, was also included as part of the stream-splitting module. If a facility indicated that it was transferring each segregated stream to a treatment unit , it was given credit for having the pump in place. Refer to Section 11.3.3 below for a more detailed description of the pumps cost module.

11.3.3 Pumps

EPA estimated costs for a facility to install and operate pumps, as necessary, to transfer wastewater and sludge from one treatment unit to another within the regulatory control options. A cost for an air-operated positive displacement pump was calculated in situations where the wastewater was presumed to contain a high amount of solids (e.g., wastewater discharged directly from washers and sludge streams). Where wastewater was to be transferred from one treatment unit to another, a cost for a positive displacement pump was calculated for flows up to 27 gpm and a centrifugal pump was costed for flows greater than 27 gpm.

Direct capital and annual costs were calculated based on the required size of each type of transfer pump. Both types of pumps were sized based on the required flow rate calculated by the cost model using mass balances around each treatment unit. EPA developed the convention that costs calculated for each treatment unit module would include the capital and annual costs for an effluent pump. Exceptions to this convention occur in the cost for the shaker screen that included both an influent and effluent pump. Also, a cost was not calculated for an effluent pump in situations where the treatment unit is the last in the option's treatment train (e.g., the DAF or the pH adjustment modules), because it was assumed that the wastewater can flow by gravity into the sewer.

Annual costs included O&M material costs and energy costs. No energy costs were associated with the air-operated positive displacement pumps because EPA assumed that all industrial laundries currently have an air compressor and supply line available to operate the positive displacement pump without incurring any additional costs.

The pump module includes an estimate of installation labor costs, based on the size and type of pump being costed. All labor estimates are based on information obtained from past effluent guidelines costing efforts, as well as engineering judgement. Installation is estimated to take one worker from 1.5 to 42 hours for various types of positive displacement and centrifugal pumps, up to a 750-gpm capacity (8).

EPA assumed that facilities that reported having two sequential treatment units in place also have the necessary transfer pump in between, and therefore calculated zero capital and annual costs for the transfer pump. All other facilities that did not report having a treatment unit located downstream from the unit costed in the module received capital and annual costs for an effluent transfer pump. For example, a facility that reported having an equalization tank followed by an oil-water separation tank in place received no costs for an effluent pump in the equalization module. However, a facility that reported an equalization tank followed by discharge to the sewer received both capital and annual costs for an equalization tank effluent pump, sized sufficiently to transfer wastewater to the next required treatment unit in the option.

11.3.4 Screening

Mechanical screens are commonly used at industrial laundries to remove lint and other solid constituents from wastewater. Therefore, EPA estimated costs for mechanical screening of a facility's untreated wastewater from the washing of nonindustrial textile items prior to recombination with treated wastewater from the washing of industrial textile items. The module calculates the costs necessary to pump the wastewater to be screened from the sump to the screen; mechanically remove lint suspended in the wastewater; discharge the lint into a collection vessel (e.g., a drum or bag); discharge the screened wastewater into a collection tank; and pump the screened wastewater from the collection tank to the next unit in the option's treatment train.

Capital and annual costs for the following equipment were included in the screening module:

- An influent positive displacement pump;
- A shaker screen;
- A screen effluent holding tank; and
- A centrifugal effluent pump.

Annual costs included O&M material costs, energy costs, and lint disposal costs. The disposal costs were based on the average nonhazardous disposal costs reported by facilities for disposing of collected lint from screens. Both the direct capital and annual costs for screens were based on the required size of the screen, which was determined based on the input flow rate(s) used by the cost model. Based on sampling data, EPA assumed that the flow rate and pollutant loads are unaffected by the screening operation. Therefore, the screen module calculated the flow rate and pollutant loads in the effluent from the screen to be equal to those in the influent.

The screen module includes an estimate of installation labor costs for the screen unit and effluent holding tank. All labor estimates are based on information obtained from equipment vendors, as well as engineering judgement. Installation of the shaker screen unit and holding tank is estimated to take one worker four hours and seven hours, respectively (9).

The annual O&M materials cost associated with the holding tank was not calculated as a separate item, but was included as part of the estimating factor for the total annual cost, based on estimates used in past effluent guidelines (9). The annual O&M materials cost was assumed to be half of the total annual cost for the holding tank (i.e., one percent of the direct capital cost), based on engineering judgement (10).

A cost was calculated for a screen if a facility did not report that it had a mechanical screen in place. Facilities reporting any type of mechanical screening (e.g., shaker screen, rotary screen) in place received zero capital and annual costs for the screen. EPA assumed that a facility reporting that it screens any portion of its wastewater would also be able to screen the wastewater generated from washing its industrial textile items and, therefore, EPA calculated zero capital and annual costs for the screen.

Costs for a maximum of two wastewater pumps to transfer the wastewater to the screen and from the holding tank to the next treatment unit, including the necessary installation labor, were also included as part of the shaker screen module. If a facility indicated that it was screening at least a portion of its wastewater, it was given credit for having the influent pump. If it also indicated that it was transferring the screened water to another treatment unit, it was also given credit for the effluent pump. Refer to Section 11.3.3 of this document for a more detailed description of the pumps cost module.

11.3.5 Equalization

EPA estimated costs for the equalization of a facility's industrial laundry wastewater. The equalization module calculates the costs necessary to equalize the wastewater prior to treatment in a mixed tank sized to absorb fluctuations in flow, pollutant load, and pH and to pump the equalized wastewater to the next unit in the option's treatment train.

Capital and annual costs for the following equipment were included in the equalization module:

- A closed tank;
- A mixer(s); and
- A centrifugal effluent pump.

Annual costs included O&M material costs and energy costs. Both the direct capital and annual costs for the equalization tanks were based on the required size of the tank. The tanks were designed to have a four-hour residence time, based on the median reported residence time for equalization tanks in the detailed questionnaire. The required size of the tanks was therefore calculated from this design parameter and the influent flow rate for each facility. The required mixer size, as well as the number of mixers, was calculated based on the size of the tank using the design parameter of 0.5 mixer hp per 1,000 gallons of tank capacity (11). EPA assumed that the pollutant loads are unaffected by equalization and, therefore, the module calculated the pollutant loads in the effluent from the equalization tank to be equivalent to those in the influent.

The equalization module includes an estimate of installation labor costs for the equalization tank and mixer. All labor estimates are based on information obtained from equipment vendors, as well as past effluent guidelines costing efforts and engineering judgement. Installation for the equalization tank and mixer is estimated to take five workers eight hours and one worker 2.4 hours, respectively (11).

The annual O&M materials cost for the equalization tank and mixer is not calculated as a separate item, but is included as part of the estimating factor for the annual cost, based on estimates used in past effluent guidelines efforts (11). The annual O&M materials costs associated with the equalization tank and mixer were assumed to be more than half of the total annual cost for each (i.e., three percent of the direct capital costs), based on engineering judgement (10).

A cost was calculated for an equalization tank if a facility did not report that it had a large enough tank in place. Facilities that had tanks with a minimum residence time of two hours were given full credit for the equalization tank, and the module calculated zero capital and annual costs for the tank. Likewise, facilities that reported having a mixer on site were given full credit for the mixer.

The costs for the effluent wastewater pump to transfer the wastewater to the next treatment unit, including the necessary installation and operating labor, were also included as part of the equalization module. If a facility indicated that it was transferring the stream to another treatment unit, it was given credit for having the effluent pump in place. Refer to Section 11.3.3 of this document for a more detailed description of the pumps cost module.

11.3.6 Dissolved Air Flotation

EPA estimated costs for DAF treatment of wastewater generated from the washing of industrial textile items in the DAF-IL regulatory option. The DAF module calculates the costs necessary to treat the wastewater with sulfuric acid, ferric chloride, and cationic and anionic polymers to form an agglomerated floc containing pollutants; float the floc to the surface of the unit; remove the floating floc from the wastewater; pump the collected floc to a sludge conditioning tank and treat it with perlite; pump the conditioned sludge to sludge dewatering; and discharge the DAF-treated wastewater to the sewer.

Capital and annual costs for the following equipment were included in the DAF module:

- An acid-feed system;

- A DAF unit, including three chemical addition units, pH controller, chemical premix tanks, and positive displacement sludge transfer pump; and

- An open sludge conditioning tank with a mixer.

Annual costs included O&M material costs, energy costs, and raw material (e.g., sulfuric acid, ferric chloride, cationic polymer, anionic polymer, and perlite) costs. Both the direct capital and annual costs for the DAF unit were based on the required capacity of the unit to treat a continuous flow of wastewater. The required capacity of the unit was calculated based on the influent flow rate(s) in gallons per minute of flow. The chemical addition rates were determined based on average reported amounts of chemical per gallon of wastewater treated. The following chemical addition rates were used by the DAF cost module:

Chemical	Gallons of Chemical per 10,000 Gallons of Industrial Laundry Wastewater Flow
Sulfuric acid	0.8
Ferric chloride	0.9
Cationic polymer	2
Anionic polymer	0.07
Perlite	0.25 pounds per pound of sludge collected from the DAF unit on a dry-solids basis

The recommended amount of perlite added per pound of DAF sludge was provided by a chemical vendor. The DAF module calculated pollutant loads in the treated wastewater effluent using target average concentrations calculated from DAF system sampling and DMQ data. The module calculated a sludge flow rate based on a median sludge generation rate (0.031 pounds of sludge per gallon of wastewater) calculated from data provided by facilities using DAF (12). The module also included the effluent flow rate based on a mass balance around the unit using the influent flow rates of wastewater and chemicals, as well as the amount of sludge removed from the wastewater though DAF treatment.

The DAF module includes an estimate of installation labor costs for the DAF unit. All labor estimates are based on information obtained from equipment vendors, as well as past effluent guidelines costing efforts and engineering judgement. Installation labor for the DAF system is estimated by a vendor to be included in an installation cost factor of six percent of the purchased cost (13).

The annual O&M materials cost for the DAF unit was estimated to be included as part of the total maintenance cost factor of the DAF system capital cost (13). The O&M materials cost associated with the DAF unit was assumed to be half of the total maintenance cost (i.e., one percent of the direct capital cost), based on engineering judgement (10).

The DAF module also includes installation labor costs for the chemical feed system. The installation labor for the chemical feed system was calculated with the total capital cost from the cost curves obtained from past effluent guidelines costing efforts. The labor hours were not broken out as separate items (14).

A cost was calculated for a DAF unit if a facility did not report that it treated its wastewater with DAF. Facilities that had DAF units of sufficient capacity were given full option credit. For example, a facility that reported treating its total wastewater flow with DAF was given full credit for the DAF-IL option and received only monitoring costs and an optimization cost allowance to comply with a rule under this option. Facilities that reported operating an induced air flotation (IAF) unit of sufficient capacity were also given full option credit. However, a facility that reported treating a portion of its wastewater was evaluated as to whether it had sufficient DAF capacity to treat the industrial laundry wastewater. For example, a facility reported that it treats 35 percent of its wastewater with DAF; 50 percent of its wastewater is industrial laundry wastewater. Under the DAF-IL option, it needs to treat 15 percent more of its wastewater to comply with the option requirements. The facility received capital and annual costs for a DAF unit sized to treat 15 percent of its wastewater flow. This additional unit together with the unit in place can treat the 50 percent industrial laundry wastewater flow.

Based on final long-term average concentrations for chemical precipitation and DAF gathered from sampling and DMQ data, chemical precipitation achieves lower pollutant concentrations in the treated wastewater than DAF. Likewise, when operated properly, ultrafiltration and microfiltration are considered to provide greater pollutant removals than DAF (15). Therefore, facilities with chemical precipitation, ultrafilters, or microfilters with sufficient capacity to treat the wastewater generated from washing industrial textile items received treatment-in-place credit for having a complete DAF system in the DAF-IL option. However, facilities with these technologies that do not have sufficient capacity received capital and annual costs for a DAF unit sized to treat their industrial laundry wastewater.

11.3.7 Chemical Precipitation

EPA estimated costs for chemical precipitation treatment of wastewater generated from washing industrial textile items in the CP-IL regulatory option. The chemical precipitation module calculates the costs necessary to treat the wastewater with lime and cationic and anionic polymers to precipitate and agglomerate pollutants from the wastewater; settle the precipitate to the bottom of the treatment tank in batch systems or continuously remove the precipitate with inclined plates in continuous systems; and pump the chemical precipitation-treated wastewater from the chemical precipitation unit to the next unit in the option's treatment train.

Capital and annual costs for the following equipment were included in the batch chemical precipitation system module:

- A mixed batch treatment tank;
- Three chemical addition units with pH controller;
- A positive displacement sludge transfer pump;
- A sludge holding tank; and
- A centrifugal effluent pump.

Capital and annual costs for the following equipment were included in the continuous chemical precipitation system module:

- A continuous chemical precipitation unit (including three chemical addition units, pH controller, chemical premix tanks and inclined plate settlers);

- A positive displacement sludge transfer pump;
- A sludge holding tank; and
- A centrifugal effluent pump.

Annual costs included O&M material costs, energy costs, and raw material (e.g., lime, cationic polymer, and anionic polymer) costs. Both the direct capital and annual costs were based on the required capacity of the unit to treat either a batch of wastewater or a continuous flow of wastewater, which was calculated based on the influent flow rate(s). Costs were calculated for batch units for facilities with less than 2,500 gallons per day of flow and continuous units for facilities with flows greater than 2,500 gallons per day. The chemical addition rates used by the module were determined based on average amounts of chemical per gallon of wastewater treated that were reported in responses to the detailed questionnaire and by sampled facilities. The following chemical addition rates were used by the chemical precipitation cost module:

Chemical	Amount of Chemical Added per 10,000 Gallons of Industrial Laundry Wastewater Flow
Lime	100 pounds
Cationic Polymer	2 gallons
Anionic Polymer	0.07 gallon

The module calculated pollutant loads in the treated wastewater effluent using target average concentrations calculated from chemical precipitation system sampling and DMQ data. The module calculated a sludge flow rate based on a median sludge generation rate (0.039 pounds of sludge per gallon of wastewater) calculated from data provided by facilities using chemical precipitation (12). The module also calculated the effluent flow rate based on a mass balance around the unit using the influent flow rates of wastewater and chemicals, as well as the amount of solids removed from the wastewater though chemical precipitation treatment.

The chemical precipitation module includes an estimate of installation labor costs for the batch and continuous units. All labor estimates are based on information obtained from an equipment vendor, as well as past effluent guidelines costing efforts and engineering judgement. Installation for the chemical precipitation systems is estimated by the vendor to take one worker 40 hours for the smallest system and two workers 80 hours for the largest system (16).

The annual O&M materials cost for the chemical precipitation unit was estimated to be included as part of the estimating factor for the total annual cost, based on past effluent guidelines costing efforts (16). The annual O&M materials cost was assumed to be more than half of the total annual cost for the chemical precipitation unit (i.e., three percent of the chemical precipitation system capital cost), based on engineering judgement (10).

A cost was calculated for a chemical precipitation unit if a facility did not report that it treated its wastewater with chemical precipitation. Facilities that had chemical precipitation units of sufficient capacity were given full option credit. For example, a facility that reported treating its total wastewater flow with chemical precipitation was given full credit for the DAF-IL and CP-IL regulatory options and received only monitoring costs and a nominal cost allowance to comply with a rule under these options. However, a facility that reported treating a portion of its wastewater with continuous chemical precipitation was evaluated as to whether it had sufficient chemical precipitation capacity to treat the wastewater according to each option, similar to the example presented in Section 11.3.6 for the DAF technology. Most facilities that have a batch chemical precipitation unit in place have a significant amount of untreated wastewater that would require treatment under the IL options, such that a continuous chemical precipitation unit would be required in addition to the batch unit in place. EPA assumed that these facilities would not continue to operate both a batch and continuous chemical precipitation unit simultaneously. Instead, these facilities received no credit toward the CP-IL option and received capital and annual costs to install and operate a new chemical precipitation system appropriately sized to treat the facility's industrial laundry wastewater.

The costs for the effluent wastewater pump to transfer the wastewater to the next treatment unit, including the necessary installation and operating labor, were also included as part of the chemical precipitation module. If a facility indicated that it was currently transferring the stream to another treatment unit, it was given credit for having the effluent pump in place. Refer to Section 11.3.3 of this document for a more detailed description of the pumps cost module.

When operated properly, ultrafiltration and microfiltration are considered to provide greater pollutant removals than chemical precipitation (15). Therefore, facilities with ultrafilters or microfilters of sufficient capacity to treat the wastewater generated from washing industrial textile items received treatment-in-place credit for having a complete chemical precipitation system in the CP-IL option.

Capital and annual costs for a complete chemical precipitation unit were calculated for facilities with DAF systems in the CP-IL option. These facilities received a salvage value credit toward the CP-IL capital costs for replacement of their existing DAF unit. The salvage value was estimated based on the reported age of the unit and the estimated capital cost. It was also assumed that facilities replacing an existing unit would not incur as many indirect capital costs as facilities installing a new treatment system. Therefore, a lower indirect capital cost factor was applied to the estimated capital cost for the chemical precipitation unit. Table 11-4 presents the lower indirect capital cost factors applied in the CP-IL option for the facilities with DAF units in place. An annual cost credit was also applied to the CP-IL annual cost for these facilities. The capital and annual O&M costs for the DAF unit were estimated using the methodology described in Section 11.3.6 of this document for the reported amount of flow treated by the existing DAF unit.

11.3.8 Sludge Dewatering

EPA estimated costs for facilities to dewater the sludge generated by either a DAF or chemical precipitation unit. The sludge dewatering module calculates the costs necessary to pump the sludge through a filter press; remove and dispose of the dewatered cake from the filter; and return the filtrate to the treatment system sump.

Capital and annual costs for the following equipment were included in the sludge dewatering system module:

- A plate and frame filter press system with accessories such as a plate shifter, platform, and cake disposal dumpsters; and

- A positive displacement influent sludge pump.

Annual costs included O&M material costs, energy costs, and dewatered cake disposal cost. The capital and annual costs associated with the filter press were based on the required size of the press, which was calculated based on the influent sludge flow rate, solids concentration, and the dewatered cake solids concentration. EPA based solids concentrations for both the sludge and dewatered cake generated by each technology on filter press vendor test data and facility responses to the detailed questionnaire. The filter press was sized based on the volume of dewatered cake that is generated from the sludge stream. The number of batches per day of dewatering was optimized by the module to minimize the size of the filter press, where possible. The volume of cake and the filtrate flow rate were calculated by the sludge dewatering module from a mass balance using the sludge flow rate and the sludge and cake solids concentrations. The additional costs for the filter press system accessories were dependent upon the required size of the filter press. The dewatered cake disposal costs were based on the average reported nonhazardous dewatered cake disposal costs per volume of cake and the module-calculated volume of dewatered cake per year for each facility. The capital and annual costs for the influent sludge pump were calculated based on the required capacity of the pump, which was based on the sludge influent flow rate.

The module is designed to return the filtrate to the facility's trench and sump system, based on typical operating procedures reported by industrial laundries. EPA assumed that the filtrate would flow by gravity from the filter press to the trench and/or sump and therefore would not require any additional collection tanks or transfer pumps. EPA assumed that the returning filtrate would not affect the raw pollutant concentrations in the untreated wastewater because the filtrate volume represents only a small percentage of the volume of the sump. The cost model adjusts the influent flow rate by a factor to account for this slight increase in influent flow rate.

The sludge dewatering module includes an estimate of installation labor costs for the filter press unit. All labor estimates are based on information obtained from an equipment vendor and engineering judgement. Installation labor for the filter press is estimated by the vendor to be included in an installation cost factor of 75 percent of the purchased cost (17).

A facility received full sludge dewatering credit if it reported having a sludge dewatering device in place to dewater sludge from a system similar to DAF or chemical precipitation. For example, facilities that reported operating a sludge dewatering device to dewater sludge generated by gravity settling were not given credit for the system. EPA assumed that such a system would not have sufficient capacity to treat the amount of sludge generated by DAF or chemical precipitation units.

The costs for the influent sludge pump to transfer the sludge into and through the filter press, including the necessary installation labor, were also included as part of the sludge dewatering module. If a facility indicated that they were dewatering an appropriate amount of sludge, they were given credit for having the influent pump in place. Refer to Section 11.3.3 of this document for a more detailed description of the pumps cost module.

11.3.9 pH Adjustment

EPA estimated costs for facilities to adjust the pH of the effluent wastewater generated by the CP-IL regulatory option. The pH adjustment module calculates the costs necessary to combine untreated linen supply wastewater and treated industrial laundry wastewater; monitor the pH of the effluent stream; and add necessary chemicals to a mixed tank to adjust the pH of the final effluent stream to within a specified range.

Capital and annual costs for the following equipment were included in the pH adjustment module:

- An open, mixed tank;
- A pH controller; and
- A chemical addition system.

Annual costs included O&M material costs, energy cost, and raw material (e.g., sulfuric acid or sodium hydroxide) costs. The capital and annual costs associated with the chemical addition system were based on the required size of the system, which was calculated based on the total influent flow rate and an estimation of the amount of acid or caustic that was required to adjust the final effluent pH to within a specific range. EPA assumed chemical precipitation-treated wastewater to have a pH of 12, based on the average pH observed during sampling episodes. EPA also assumed that untreated light industrial laundry wastewater had a pH of 10, based on sampling data. Based on existing industrial laundry limitations on pH at the point of discharge, EPA assumes that the final effluent pH must be between 5 and 10 upon discharge. Therefore, according to these assumptions, the wastewater generated by the CP-IL regulatory option requires pH adjustment prior to discharge in order for facilities to continue to meet their existing pH limits. EPA assumed DAF-treated wastewater to have a pH of 9, based on sampling data. Since the wastewater generated by the DAF-IL regulatory option is already within the assumed pH limits, pH adjustment costs are not calculated for this option.

The capital and annual costs associated with the pH adjustment tank were based on the required size of the tank, which was calculated, based on the influent flow rate, to have a three-minute residence time for the wastewater. This is the required residence time to achieve a target pH in a mixed tank with liquid chemical addition (18). The mixer was also costed based on its required size, which was determined based on the size of the pH adjustment tank.

The pH adjustment module calculates the resulting pollutant loads from the combination of the treated and untreated streams. EPA assumed that pH adjustment would not affect the pollutant concentrations in the final effluent. The pH adjustment module calculated the final pollutant loads to be equivalent to those in the pH adjustment influent.

The pH adjustment module includes an estimate of installation labor costs for the pH adjustment tank and mixer. All labor estimates are based on information obtained from equipment vendors, as well as past effluent guidelines costing efforts and engineering judgement. Installation for the pH adjustment tank and mixer is estimated to take one worker seven hours and 2.4 hours, respectively (19).

The annual O&M materials cost for the pH adjustment tank and mixer was not calculated as a separate item, but included as part of the estimating factor for the annual cost, based on estimates used in past effluent guidelines efforts (19). The annual O&M materials costs associated with the pH adjustment tank and mixer were assumed to be more than half of the total annual cost for each (i.e., three percent of the direct capital costs), based on engineering judgement (10).

The pH adjustment module also includes installation labor costs for the chemical feed system. The installation labor for the chemical feed system was included in the total capital cost used from past effluent guidelines costing efforts. The labor hours were not broken out as separate items (19).

A facility received full pH adjustment credit if it reported using some type of pH adjustment. Costs were estimated for facilities that reported having some of the components of the pH adjustment system to add the necessary parts to complete the system. Facilities did not have to meet a minimum residence time requirement and received treatment-in-place credit for any tank that was available to use for pH adjustment.

11.3.10 Treatment System Building

EPA estimated costs for facilities to construct and maintain a building to house the option treatment system using the building module. Capital and annual costs for the following equipment were included in the treatment system building:

- A concrete floor slab;
- A concrete curb around the building perimeter;
- A rectangular-shaped, pre-engineered steel frame building; and
- Utilities (plumbing, HVAC, and electricity).

Annual costs include costs for labor and materials for the yearly maintenance and repair of the building. These costs were estimated to be 3.5 percent of the direct capital cost (10). The capital cost associated with constructing the building was based on the required size of the building. The square footage requirement of the building was determined for each regulatory option based on the equipment space requirements for a low, medium, and large flow of wastewater. Dimensions of various size equipment pieces were gathered from equipment specifications supplied by vendors. The building square footage was calculated by summing each of the option equipment space requirements, allowing for a five- to ten-foot clearance between equipment pieces and the building walls. The building space design, as well as the capital cost per square foot, were increased since proposal based on comments and industry supplied data (20).

EPA observed during site visits and sampling episodes that facilities were able to install wastewater treatment equipment in existing space either inside the facility or on their existing property. Based on this information, EPA assumed that a facility would not need to purchase additional land to install wastewater treatment equipment required by the technology control options.

A facility received full credit for a building in place if they reported having sufficient space available in their existing building. These facilities received zero capital and annual costs for a building. Facilities that reported having less than the option's required space or that did not report available space in the detailed questionnaire had costs estimated to construct and maintain a building.

11.3.11 Contract Haul In Lieu of Treatment On Site

EPA estimated the cost of contract hauling wastewater for off-site treatment at a treatment, storage, and disposal facility (TSDF) or a Centralized Waste Treater (CWT) facility. These estimated costs included the cost to transport the wastewater to the off-site treatment facility, and were compared to the cost of on-site treatment. For some industrial laundries with low flow rates, it was less expensive for a facility to contract for off-site treatment and disposal rather than treat the wastewater on site. EPA compared the annualized cost of transportation and off-site treatment with the annualized cost to treat that wastewater on site for each regulatory option.

Capital and annual costs for the following equipment were included in the contract-haul-in-lieu-of-treatment module:

- Stream splitting costs;
- An influent pump; and
- A wastewater storage tank.

Annual costs included O&M labor and material costs, energy cost, tank sampling costs, and transportation fees. The capital and annual costs for the influent pump and wastewater storage tank are dependent upon the required sizes for each. The tank and pump sizes were calculated by the contract haul module based on the flow rate of the wastewater to be collected and hauled. The tank was sized to hold up to one week of wastewater flow. The tank was also 50 percent overdesigned to accommodate fluctuations in facility production. The costs for transportation of the wastewater to the off-site industrial treatment facility were calculated based on the number of trips per year required to haul the wastewater (assuming wastewater is hauled in one 5,000-gallon tank truck for each trip) and a cost per trip fee provided by a vendor. The cost per gallon to treat the wastewater, as well as the annual tank sampling fee, were also obtained from vendor information.

The contract haul module includes an estimate of installation and O&M labor costs for the wastewater storage tank and installation of stream-splitting components. All labor estimates are based on information obtained from equipment vendors, as well as past effluent guidelines costing efforts and engineering judgement. Installation labor for the storage tank is estimated by the vendor to take five workers eight hours. The annual O&M labor cost for the tank is not calculated as a separate item, but included as part of the estimating factor for the annual cost (i.e., five percent of the direct capital cost of the tank), based on estimates used by past effluent guidelines efforts. In addition, it was estimated that it would take one facility worker two hours to assist in pumping a 5,000-gallon load of wastewater into the tank truck (21). The installation labor required for the stream-splitting components is described in Section 11.3.2 of this document.

A facility received full tank and/or pump credits if it indicated that a sufficiently sized tank or pump was available on site to transfer and store the wastewater to be hauled. These facilities received zero capital and annual costs for the pump and tank. All facilities with or without equipment credits were costed for the annual sampling, transportation, and treatment costs.

The costs for the influent pump to transfer the wastewater into the storage tank, including the necessary installation and operating labor, were also included as part of the contract-haul-in-lieu-of-treatment module. Refer to Section 11.3.3 of this document for a more detailed description of the pumps cost module.

11.3.12 Compliance Monitoring

EPA calculated annual compliance monitoring costs for all industrial laundry facilities that discharge wastewater. These costs included laboratory costs to analyze one sample each of volatile and semivolatile organics and quantitative metals monthly, and to analyze TPH (measured as SGT-HEM)[1] four times per month. The costs for each type of analysis per sample were obtained from a laboratory contracted by EPA on past wastewater sampling efforts. Also included was the cost for glassware and containers needed to package the samples. These costs were obtained from data acquired during the EPA wastewater sampling efforts.

Facilities that reported in the detailed questionnaire that they monitored their wastewater were only costed for the analyses. Otherwise, facilities were costed for the analysis and materials required for the wastewater monitoring (22).

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[1]Silica gel treated-hexane extractable material (SGT-HEM) is measured by Method 1664 promulgated at 64 FR 26315; May 14, 1999. In this method, EPA defines SGT-HEM as non-polar material (NPM). Throughout this document and the Industrial Laundries Administrative Record, EPA refers to SGT-HEM as total petroleum hydrocarbon (TPH).

11.4 Engineering Costs for the Regulatory Options

Table 11-5 summarizes estimated engineering costs for the regulatory options. Costs shown include capital and annual O&M (including energy usage) costs totaled for the 190 in-scope facilities extrapolated to represent the entire industrial laundries industry of 1,742 facilities. In addition, the capital and O&M costs are shown for the three exclusions incorporated into each of the regulatory options, as discussed in Chapter 8 of this document. Table 11-6 presents estimated engineering costs on an amortized yearly basis for the regulatory options. The methodology used to calculate the amortized annual costs from the capital and annual option costs calculated by the cost model is presented in the EA for the industrial laundries rulemaking (1).

EPA estimates that chemical precipitation's lower O&M costs make it less expensive to operate on an annualized basis than DAF. Because EPA's performance data show that chemical precipitation achieves better treatment than DAF, facilities operating a DAF unit were assumed to replace that unit with a chemical precipitation unit in order to comply with the CP-IL option pretreatment standards, as described in Section 11.2.3 of this document. In EPA's estimates, facilities that currently operate a DAF would realize an O&M cost savings for operating a chemical precipitation unit compared to operating the DAF unit. Therefore, EPA's estimated costs for the CP-IL option include the O&M cost credit for facilities that currently operate a DAF to replace the DAF unit with a chemical precipitation unit.

11.5 Compliance Costs Estimated from 1998 Facility Treatment-In-Place Data

In 1998, the industrial laundries trade associations (the Uniform and Textile Service Association (UTSA) and the Textile Rental Services Association (TRSA)) surveyed the industrial laundries to which EPA sent a detailed questionnaire in 1994. More information on the types of data collected by the UTSA/TRSA survey is provided in Section 3.7.2 of this document.. The purpose of the survey was to provide EPA with updated information on treatment technologies in place at industrial laundries. Of the 190 in-scope facilities, 162 responded to the UTSA/TRSA survey. Section 6.5.16 of this document summarizes the types of equipment that were reported in the survey.

At proposal (62 FR 66181; December 17, 1997), EPA estimated capital and annual O&M compliance costs based on treatment-in-place information reported in the detailed questionnaire for the 1993 operating year. For the Notice of Data Availability (NODA) (63 FR 71054; December 23, 1998); EPA compared the compliance costs estimated at proposal to the compliance costs estimated using the treatment-in-place information reported in the UTSA/TRSA survey for the 1998 operating year for the DAF-IL and CP-IL regulatory options with the 1 Million/255 K exclusion. EPA's methodology and the results of the comparison are discussed below.

EPA compared the treatment system description contained in the UTSA/TRSA survey to the treatment system components reported in the detailed questionnaire for each

Table 11-5

Summary of Engineering Costs for the Regulatory Options

Option	Capital Cost (Million 1993 $s)	O&M Cost (Million 1993 $s per Year)
Capital and Annual Costs for All Industrial Laundries[1]		
CP-IL	544	124
DAF-IL	451	150
Capital and Annual Costs with the 1 Million/255 K Exclusion[2]		
CP-IL	515	117
DAF-IL	425	142
Capital and Annual Costs with the 3 Million/120 K Exclusion[3]		
CP-IL	395	89.1
DAF-IL	320	122
Capital and Annual Costs with the 5 Million/255 K Exclusion[4]		
CP-IL	242	52.9
DAF-IL	188	69.5

[1]The entire industrial laundries industry is estimated to consist of 1,742 facilities.
[2]There are 136 facilities processing less than 1,000,000 pounds of incoming laundry and less than 255,000 pounds of industrial towels annually that are excluded, leaving a total of 1,606 facilities.
[3]There are 518 facilities processing less than 3,000,000 pounds of incoming laundry and less than 120,000 pounds of industrial towels annually that are excluded (this exclusion also excludes <u>all</u> facilities excluded under the 1 Million/255 K exclusion, above), leaving a total of 1,224 facilities.
[4]There are 953 facilities processing less than 5,000,000 pounds of incoming laundry and less than 255,000 pounds of industrial towels annually that are excluded, leaving a total of 789 facilities.

Source: Output from the Industrial Laundries Design and Cost Model, February 15, 1999.

Table 11-6

Summary of Annualized Engineering Costs for the Regulatory Options

Option	Annualized Cost (Million 1993 $s per Year)
Annualized Post-Tax Cost for All Industrial Laundries[1]	
CP-IL	128
DAF-IL	137
Annualized Post-Tax Cost with the 1 Million/255 K Exclusion[2]	
CP-IL	121
DAF-IL	129
Annualized Post-Tax with the 3 Million/120 K Exclusion[3]	
CP-IL	90.8
DAF-IL	98.8
Annualized Post-Tax Cost with the 5 Million/255 K Exclusion[4]	
CP-IL	53.9
DAF-IL	60.0

[1]The entire industrial laundries industry is estimated to consist of 1,742 facilities.
[2]There are 136 facilities processing less than 1,000,000 pounds of incoming laundry and less than 255,000 pounds of industrial towels annually that are excluded, leaving a total of 1,606 facilities.
[3]There are 518 facilities processing less than 3,000,000 pounds of incoming laundry and less than 120,000 pounds of industrial towels annually that are excluded (this exclusion also excludes all facilities excluded under the 1 Million/255 K exclusion, above), leaving a total of 1,224 facilities.
[4]There are 953 facilities processing less than 5,000,000 pounds of incoming laundry and less than 255,000 pounds of industrial towels annually that are excluded, leaving a total of 789 facilities.

Source: Economic Assessment for the Final Action Regarding Pretreatment Standards for the Industrial Laundries Point Source Category.

facility. In the UTSA/TRSA survey, most facilities did not report the treatment system design parameters. To calculate the changes in the capital and annual O&M compliance costs, EPA made the following assumptions when reviewing the UTSA/TRSA survey data:

- EPA continued to use the flow and production data reported in the detailed questionnaire for all facilities.

- For facilities treating a portion of their wastewater that did not indicate the percentage of wastewater treated, EPA assumed that they are treating only a small portion of their total wastewater.

- For facilities using DAF, chemical precipitation, or chemical emulsion breaking treatment, EPA assumed that the facility is operating these systems in a manner equivalent to the technology control options costed by EPA.

- For facilities providing treatment system descriptions that were not detailed enough for EPA to determine what treatment system was operated, EPA assumed that they are still operating the treatment system reported in the detailed questionnaire.

- For a facility reporting use of biological treatment, EPA assumed that it does not have treatment in place equivalent to any of the technology control options.

- For a denim prewash facility that operated a partial treatment system, EPA assumed that it treats wastewater from all items except for the denim prewash, which is not included in the scope of the rule.

- EPA did not reduce costs to reflect ancillary treatment technologies (e.g., screens, filter presses, equalization tanks) added since those reported in the detailed questionnaire.

- EPA did not make any changes in the compliance costs for ten facilities that reported closing or rebuilding since 1993.

- For facilities that reported that they planned to install treatment systems in the future, EPA assumed that they are still operating the treatment system reported in the detailed questionnaire.

- EPA assumed facilities that did not respond to the UTSA/TRSA survey (28 out of the 190 in-scope facilities) were still operating the treatment system reported in the detailed questionnaire.

Table 11-7 presents a comparison of the compliance capital and annual O&M costs estimated for the proposal and the compliance capital and annual O&M costs estimated

Table 11-7

Capital and Annual O&M Compliance Cost Comparison Between the Costs Estimated at Proposal and Costs Incorporating UTSA/TRSA Survey Data for the DAF-IL and CP-IL Regulatory Options[1]

Excluding Facilities with Less than 1 Million Pounds per Year Total Production and Less than 255,000 Pounds per Year Shop and Printer Towel/Rag Production[2]

Option	Compliance Cost Estimated for Proposal[3] (Million 1993 $s)	Compliance Cost Estimated Based on UTSA/TRSA Survey[4] (Million 1993 $s)	Percent Decrease in Compliance Costs
Capital Cost			
CP-IL	$515	$408	21%
DAF-IL	$425	$299	30%
Annual O&M Cost			
CP-IL	$117 per year	$71.7 per year	39%
DAF-IL	$142 per year	$114 per year	20%

[1]Numbers in this table were calculated using more significant figures than shown.
[2]136 of the 1,742 total industrial laundries are excluded from compliance under this criterion.
[3]The costs estimated for proposal (62 FR 66181; December 17, 1997) are based on treatment-in-place information from the detailed questionnaire for the 1993 operating year.
[4]The costs were estimated based on the treatment-in-place information in the UTSA/TRSA survey for the 1998 operating year (presented in the Notice of Data Availability, 63 FR 71054; December 23, 1998).

using the UTSA/TRSA survey data for the CP-IL and DAF-IL regulatory options with the 1 Million/255 K exclusion. The costs were calculated in 1993 dollars using the assumptions and methodologies described previously in this chapter. The capital costs decreased by 107 million dollars and 126 million dollars (21 percent and 30 percent) from 1993 to 1998 in the CP-IL and DAF-IL options, respectively. The annual O&M costs decreased by 45 million dollars and 28 million dollars (39 percent and 20 percent) from 1993 to 1998 in the CP-IL and DAF-IL options, respectively. Based on this comparison, EPA estimates that the actual costs for the industrial laundries industry to comply with the regulatory options (regardless of the specific exclusion) would be less in both capital and annual O&M costs than the costs calculated for the final action, based on the 1993 operating year.

11.6 References

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CHAPTER 12

GLOSSARY OF TERMS

2LIM: A term used by EPA to designate "Combo" technology control options on which the standards are based on either DAF or chemical precipitation treatment technologies, as appropriate. The specific set of standards that are applied is based on which technology was determined to be less expensive to install and operate at a facility or was reported to be in place at the facility.

Absorbents: Substance used to absorb leaks, spills, and sprays around machinery and workstations.

Administrator: The Administrator of the U.S. Environmental Protection Agency.

All: A term used by EPA to designate technology control options that treat the total facility process wastewater stream.

Annually: For purposes of the exclusion, annually would mean per calendar year.

Agency: The U.S. Environmental Protection Agency.

BAT: The best available technology economically achievable, as described in section 304(b)(2) of the Clean Water Act.

BCT: The best conventional pollutant control technology, as described in section 304(b)(4) of the Clean Water Act.

Bench-scale operation: Laboratory testing of materials, methods, or processes on a small scale, such as on a laboratory worktable.

BMP or BMPs: Best management practice(s), as described in section 304(e) of the Clean Water Act or as authorized by section 402 of the CWA.

BOD_5: Five-day biochemical oxygen demand. A measure of biochemical decomposition of organic matter in a water sample. It is determined by measuring the dissolved oxygen consumed by microorganisms to oxidize the organic contaminants in a water sample under standard laboratory conditions of five days and 20°C. BOD_5 is not related to the oxygen requirements in chemical combustion.

BPT: The best practicable control technology currently available, as described in section 304(b)(1) of the Clean Water Act.

Buffing pads: Items used to polish floors.

CAA: Clean Air Act. The Air Pollution Prevention and Control Act (42 U.S.C. 7401 et. seq.), as amended, inter alia, by the Clean Air Act Amendments of 1990 (Public Law 101-549, 104 Stat. 2399).

CEB: Chemical emulsion breaking. A term used by EPA to designate a technology control option on which the standards are based on chemical emulsion breaking treatment of the wastewater generated from laundering of heavy industrial textile items (e.g., shop towels, printer towels/rags, mops, fender covers, and filters).

CFR: Code of Federal Regulations, published by the U.S. Government Printing Office. A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the federal government.

Clean room garments: Used in particle- and static-free environments by computer manufacturing, pharmaceutical, biotechnology, aerospace, and other customers to control contamination in production areas.

CN: Abbreviation for total cyanide.

COD: Chemical oxygen demand - A nonconventional bulk parameter that measures the total oxygen-consuming capacity of wastewater. This parameter is a measure of materials in water or wastewater that are biodegradable and materials that are resistant (refractory) to biodegradation. Refractory compounds slowly exert demand on downstream receiving water resources. Certain of the compounds measured by this parameter have been found to have carcinogenic, mutagenic, and similar adverse effects, either singly or in combination. It is expressed as the amount of oxygen consumed by a chemical oxidant in a specific test.

Combo: A term used by EPA to designate technology control options on which the standards are based on a combination of DAF and chemical precipitation treatment technologies. The set of standards are compiled by taking the higher concentration from either DAF or chemical precipitation treatment of each pollutant.

Contract hauling: The removal of any waste stream from the plant or facility by a company authorized to transport and dispose of the waste, excluding discharges to sewers or surface waters.

Control authority: (1) The POTW if the POTW's submission for its pretreatment program (§403.3(t)(1)) has been approved in accordance with the requirements of §403.11; or (2) the approval authority if the submission has not been approved.

Conventional pollutants: Constituents of wastewater as determined in section 304(a)(4) of the Clean Water Act and the regulations thereunder (i.e., biochemical oxygen demand (BOD_5), total suspended solids (TSS), oil and grease, fecal coliform, and pH).

<u>Cooperative</u>: An enterprise or organization owned by and operated for the benefit of those using its services. For purposes of this rule, a laundry serving like facilities owned by and/or operated for the benefit of those facilities.

<u>CP</u>: Chemical precipitation. A term used by EPA to designate technology control options on which the standards are based on chemical precipitation treatment of all or part of the wastewater.

<u>CWA</u>: Clean Water Act. The Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. 1251 <u>et</u> <u>seq</u>.).

<u>DAF</u>: Dissolved air flotation. A term used by EPA to designate technology control options on which the standards are based on DAF treatment of all or part of the wastewater.

<u>Daily discharge</u>: The discharge of a pollutant measured during any calendar day or any 24-hour period.

<u>Denim prewash</u>: Washing of denim material or manufactured denim items prior to sale to soften the fabric and/or alter its appearance. This is achieved through use of chemicals and processes such as stone, acid, and ice washing.

<u>Detailed questionnaire</u>: 1994 Industrial Laundries Questionnaire. A questionnaire sent by EPA to collect detailed technical and economic information from industrial laundry and linen facilities for the 1993 operating year, under authority of section 308 of the Clean Water Act. The questionnaire was sent to those facilities likely to be affected by promulgation of effluent limitations guidelines, pretreatment standards, and new source performance standards for their industry.

<u>DMQ</u>: 1995 Detailed Monitoring Questionnaire.   A questionnaire sent by EPA to 37 industrial laundries based on responses to the detailed questionnaire that requested available monitoring data for 1993.

<u>Direct discharger</u>: The discharge of a pollutant or pollutants directly to a water of the United States with or without treatment by the discharger.

<u>Dry cleaning</u>: The cleaning of fabrics using an organic-based solvent rather than water-based detergent solution.

<u>Dual-phase washing</u>: The dry cleaning and water washing of laundry items in series without drying the items between the solvent and water phases.

<u>Effluent</u>: Wastewater discharges.

<u>EPA</u>: The U.S. Environmental Protection Agency.

Facility: All contiguous property owned, operated, leased or under control of the same person, or corporate or business entity. The contiguous property may be divided by public or private right-of-way.

Fender covers: Items used in the automobile repair and services industry to protect the fenders of automobiles from oil, grease, dirt, and other damage.

FR: Federal Register, published by the U.S. Government Printing Office, Washington, D.C. A publication making available to the public regulations and legal notices issued by federal agencies.

HAPS: Hazardous air pollutants.

Hazardous waste: Any material that meets the Resource Conservation and Recovery Act definition of "hazardous waste" contained in 40 CFR Part 261.

Health care items: Items such as hospital gowns, linen, and towels used in hospitals, doctors' offices, and dentists' offices.

Heavy: A term used by EPA to designate treatment control options that treat facility wastewater generated from the laundering of heavy industrial textile items (e.g., shop towels, printer towels/rags, mops, fender covers, and filters) and are based on standards developed from wastewater generated from the laundering of heavy industrial textile items.

HEM: Hexane extractable material. A method-defined parameter that measures the presence of relatively nonvolatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and related material that are extractable in the solvent n-hexane. This parameter does not include materials that volatilize at temperatures below 85°C (see Method 1664, promulgated at 64 FR 26315; May 14, 1999). EPA uses the term "HEM" synonymously with the conventional pollutant oil and grease (O&G).

Household laundry: Items that are "noncommercially" owned or are domestic in nature. These items may range from clothing to small rugs.

Indirect discharge: The discharge of a pollutant or pollutants to a publicly owned treatment works (POTW) with or without pretreatment by the discharger.

Industrial laundry: Any facility that launders industrial textile items from off site as a business activity (i.e., launders industrial textile items for other business entities for a fee or through a cooperative agreement). Either the industrial facility or the off-site customer may own the industrial laundered textile items; this includes textile rental companies that perform laundering operations.

IL: A term used by EPA to designate treatment control options that treat the facility wastewater generated from the laundering of industrial textile items and are based on standards developed from wastewater generated from the laundering of all items.

Industrial textile items: Items such as, but not limited to, industrial: shop towels, printer towels/rags, furniture towels, rags, mops, mats, rugs, tool covers, fender covers, dust-control items, gloves, buffing pads, absorbents, uniforms, and filters.

Industrial towels: Items such as, but not limited to: shop towels, printer towels/rags, and furniture towels.

Inorganic wastewater treatment chemicals: Inorganic chemicals that are commonly used in wastewater treatment systems to aid in the removal of pollutants through physical/chemical technologies such as chemical precipitation, flocculation, neutralization, chemical oxidation, hydrolysis, and/or adsorption.

Laundering: Washing items with water, including water washing following dry cleaning.

Linen: Items such as sheets, pillow cases, blankets, bath towels and washcloths, hospital gowns and robes, tablecloths, napkins, tableskirts, kitchen textile items, continuous roll towels, laboratory coats, family laundry, executive wear, mattress pads, incontinence pads, and diapers. This list is intended to be all-inclusive.

Linen flatwork/full dry: Items such as napkins, tablecloths, and sheets.

LTA: Long-term average. For purposes of the pretreatment standards, average pollutant levels achieved over a period of time by a facility, subcategory, or technology option. LTAs were used in developing the standards in the industrial laundries proposed rule.

Minimum level: The level at which an analytical system gives recognizable signals and an acceptable calibration point.

Miscellaneous not our goods (NOG): Items that are commercially owned by an outside company. Industrial laundries do not always know the breakdown of these items.

New source: As defined in 40 CFR 122.2, 122.29, and 403.3 (k), a new source is any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced (1) for purposes of compliance with New Source Performance Standards, after the promulgation of such standards under CWA section 306; or (2) for the purposes of compliance with Pretreatment Standards for New Sources, after the publication of proposed standards under CWA section 307(c), if such standards are thereafter promulgated in accordance with that section.

Noncontact cooling water: Water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product, or finished product. This term is not intended to relate to air conditioning systems.

Non-water quality environmental impact: An environmental impact of a control or treatment technology, other than to surface waters.

Noncontinuous or intermittent discharge: Discharge of wastewaters stored for periods of at least 24 hours and released on a batch basis.

Nonconventional pollutants: Pollutants that are neither conventional pollutants nor toxic pollutants listed at 40 CFR Section 401.

Nondetect value: A concentration-based measurement reported below the minimum level that can reliably be measured by the analytical method for the pollutant.

NPDES: The National Pollutant Discharge Elimination System, a federal program requiring industry dischargers, including municipalities, to obtain permits to discharge pollutants to the nation's water, under section 402 of the CWA.

NPM: Non-polar material. A method-defined parameter that measures the substances that remain after n-hexane extractable material is exposed to silica gel. NPM contains straight and branched chain hydrocarbons and other chemical substances in which there are either no mixture of atoms of different types or these mixtures are "balanced" in the molecule (see Method 1664, promulgated at 64 FR 26315; May 14, 1999). EPA uses the term "NPM" synonymously with silica gel treated-hexane extractable material (SGT-HEM).

NRDC: Natural Resources Defense Council.

NSPS: New source performance standards. This term refers to standards for new sources under section 306 of the CWA.

OC-Only: Prelaundering organics control. A term used by EPA to designate a technology control option that processes industrial towels (e.g., shop towels, printer towels/rags) in an air/steam tumbler to remove volatile organic compounds prior to water washing.

Off site: "Off site" means outside the boundaries of the facility.

On site: "On site" means within the boundaries of the facility.

Oil and grease (O&G): A method-defined parameter that measures the presence of relatively nonvolatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and related materials that are extractable in Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane). This parameter does not include materials that volatilize at temperatures below 75°C (see Method 413.1). O&G is a conventional pollutant as defined in section 304(a)(4) of the Clean Water Act and in 40 CFR Part 401.16. O&G is also measured by the hexane extractable material (HEM) method (see Method 1664, promulgated at 64 FR 26315; May 14, 1999).

P2: Pollution prevention.

Pilot-scale: The trial operation of processing equipment which is the intermediate stage between laboratory experimentation and full-scale operation in the development of a new process or product.

PM: Particulate matter.

Point source category: A category of sources of water pollutants that are included within the definition of "point source" in section 502(14) of the CWA.

Pollutant (to water): Dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, certain radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water. See CWA Section 502(6); 40 CFR 122.2.

POTW or POTWs: Publicly owned treatment works. A treatment works as defined by Section 212 of the CWA, which is owned by a state or municipality (as defined by Section 502(4) of the Act). This definition includes any devices and systems used in the storage, treatment, recycling and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes, and other conveyances only if they convey wastewater to a POTW Treatment Plant. The term also means the municipality as defined in Section 502(4) of the CWA, which has jurisdiction over the indirect discharges to and the discharges from such a treatment works.

PPA: Pollution Prevention Act of 1990 (42 U.S.C. 13101 et seq., Pub.L. 101-508, November 5, 1990).

PDS: Preliminary Data Summary for the Industrial Laundries Industry. A document that was prepared by EPA summarizing sampling data from five industrial laundries collected between 1985 and 1987.

Pretreatment standard: A regulation specifying industrial wastewater effluent quality required for discharge to a POTW.

Printer towels/rags: Towels used to clean solvents, inks, or soils from various objects or to wipe up spilled solvents and other liquids until they are saturated. They are commonly used in publishing and printing shops.

Priority pollutants: The toxic pollutants listed in 40 CFR Part 423, Appendix A.

Process wastewater collection system: A piece of equipment, structure, or transport mechanism used in conveying or storing a process wastewater stream. Examples of process wastewater collection system equipment include individual drain systems, wastewater tanks, surface impoundments, and containers.

PSES: Pretreatment standards for existing sources of indirect discharges, under section 307(b) of the CWA.

PSNS: Pretreatment standards for new sources of indirect discharges, under section 307(b) and (c) of the CWA.

RCRA: Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901, et seq.).

RREL: Risk Reduction Engineering Laboratory.

Reuse: The use in laundry operations of all or part of a waste stream produced by an operation which would otherwise be disposed of, whether or not the stream is treated prior to reuse, and whether the reused waste stream is fed to the same operation or to another operation.

RFA: The Regulatory Flexibility Act as amended by SBREFA (5 U.S.C. 60 et seq.).

Rewash items: Items that require a second washing to be in an acceptable state for return to the customer.

Screener questionnaire: Four different two-page questionnaires mailed by EPA to facilities in the laundries industry to develop the scope of the industrial laundries regulation, identify the population of the industrial laundries industry, and select facilities to receive the more detailed questionnaire.

SBA: Small Business Administration.

SBREFA: Small Business Regulatory Enforcement Fairness Act of 1996 (P.L. 104-121, March 29, 1996).

Septic system: A system which collects and treats wastewater, particularly sanitary sewage. The system is usually composed of a septic tank which settles and anaerobically degrades solid waste, and a drainfield which relies on soil to adsorb or filter biological contaminants. Solid wastes are periodically pumped out of the septic tank and hauled to off-site disposal.

SGT-HEM: Silica gel treated-hexane extractable material. A method-defined parameter that measures the presence of mineral oils that are extractable in the solvent n-hexane and not adsorbed by silica gel. This parameter does not include materials that volatilize at temperatures below 85°C (see Method 1664, promulgated at 64 FR 26315; May 14, 1999). EPA defines SGT-HEM as non-polar material (NPM). Throughout this document and the Industrial Laundries Administrative Record, EPA refers to SGT-HEM as total petroleum hydrocarbon (TPH).

Shop towels: Towels used to clean oil and grease or soils from various objects or to wipe up oil and grease and other liquids until they are saturated. They are commonly used in machine shops, automotive repair shops, and gas stations.

SIC: Standard Industrial Classification. A numerical categorization system used by the U.S. Department of Commerce to denote segments of industry. An SIC code refers to the principal product, or group of products, produced or distributed, or to services rendered by an operating establishment. SIC codes are used to group establishments by the primary activity in which they are engaged.

Small business: Businesses with annual revenues less than $10.5 million. This is the higher of the two Small Business Administration definitions of small businesses for SIC codes 7218 and 7213.

Source reduction: The reduction or elimination of waste generation at the source, usually within a process. Any practice that: 1) reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal; and 2) reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.

Toxic pollutants: The pollutants designated by EPA as toxic in 40 CFR Part 401.15. Also known as priority pollutants.

TOC: Total organic carbon. A nonconventional bulk parameter that measures the total organic content of wastewater. Unlike five-day biochemical oxygen demand (BOD_5) or chemical oxygen demand (COD), TOC is independent of the oxidation state of the organic matter and does not measure other organically bound elements, such as nitrogen and hydrogen, and inorganics that can contribute to the oxygen demand measured by BOD_5 and COD. TOC methods utilize heat and oxygen, ultraviolet irradiation, chemical oxidants, or combinations of these oxidants to convert organic carbon to carbon dioxide (CO_2). The CO_2 is then measured by various methods.

TPH: Total petroleum hydrocarbon. A method-defined parameter that measures the presence of mineral oils that are extractable in Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane) and not absorbed by silica gel. This parameter does not include materials that volatilize at temperatures below 70°C (see Method 418.1). Throughout this document and the Industrial Laundries Administrative Record, EPA refers to silica gel treated-hexane extractable material (SGT-HEM) as TPH.

TRSA: Textile Rental Services Association of America.

TSCA: Toxic Substances Control Act (15 U.S.C. 2601 et seq.)

TSS: Total suspended solids.

Towel Only: A term used by EPA to designate a technology control option that treats facility wastewater generated from the laundering of industrial towels (e.g., shop towels and printer towels/rags) with dissolved air flotation (DAF) and is based on standards developed from wastewater generated from the laundering of industrial towels and treated by DAF technology.

TWL: A term used by EPA to designate treatment control options that treat facility wastewater generated from the laundering of heavy industrial textile items (e.g., shop towels, printer towels/rags, mops, fender covers, and filters) and are based on standards developed from wastewater generated from the laundering of all items.

UTSA: Uniform and Textile Service Association.

Variability factor: The daily variability factor is the ratio of the estimated 99th percentile of the distribution of daily values divided by the expected value, median or mean, of the distribution of the daily data. The monthly variability factor is the estimated 95th percentile of the distribution of the monthly averages of the data divided by the expected value of the monthly averages.

VOCs: Volatile organic compounds.

Water washing: The process of washing laundry items in which water is the solvent used.

Waters of the United States: The same meaning set forth in 40 CFR 122.2.

Wet air pollution or odor pollution control system scrubbers: Any equipment using water or water mixtures to control emissions of dusts, odors, volatiles, sprays, or other air pollutants.

Zero discharge: No discharge of process wastewater pollutants to waters of the United States or to a POTW.